THE AEROPLANE

Incorporating
Aeronautical Engineering
Edited by - - THURSTAN JAMES

Founder and First Editor
(1911-1939), C. G. GREY

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THE RIGHT TO DECIDE

FOR yet another week the placing by British European Airways Corporation of its order for a new jet airliner has been held up. And it has been held up, not because one of our nationalized airline companies does not know its own mind, but because the Government has decided that occasion must be taken of this opportunity to bring about some regrouping in the aircraft industry. There are plenty of people who believe that such regrouping might very well be for the general good. We have met very few people who consider that a decision by B.E.A. on technical grounds to make a specific purchase should be vetoed by a Government department. It is B.E.A. that is responsible for making money out of its air transport activities, not the Ministry of Supply. And it will be the directors of B.E.A., not the Ministry of Supply, not M.T.C.A., who will have to carry any adverse financial outcome that may arise from interference with conclusions reached on a technical basis.

We have little doubt that when the matter is raised in Parliament the Government will be in no position to deny the right of a nationalized air corporation to make its own technical decisions. This right was upheld when B.O.A.C. wanted to buy jet airliners from the United States. As the old saying has it: "What is sauce for the goose is sauce for the gander."

It is all the more surprising that so much is being made of this particular order in the sense that the aeroplanes involved are, by modern standards, not big aeroplanes. They are to weigh less, we believe, than 120,000 lb. fully loaded. It has been stated that the three Rolls-Royce turbojets are to be in the tail, Caravelle-style. The design problems then are straightforward. Indeed we cannot imagine a designer who would not be delighted at the thought of having a wing to design with no engines in, or under, it.

People who build aeroplanes have all sorts of rough and ready rules for estimating man-hours. One such useful rule-of-thumb figure is that of 40 man-hours per lb. of structure weight. For the prototype of this 100,000 lb. aeroplane the man-hours involved might be of the order 1,200,000, which would not make such an enormous demand on production staffs. We suppose that fewer than 500 people worked on the Brabazon prototype. It would certainly be strange if more than 1,000 could be deployed on the B.E.A. prototype. Other calculations indicate that the number of drawings involved would reach nothing like the astronomical figures achieved for new American aircraft, the design man-hours for which were reported by Air Commodore Banks in a recent Royal Aeronautical Society lecture.

We feel these points are worth making. So many outside commentators have been airing their views that the man-in-the-street, that mythical figure, might be excused for thinking that the Aircraft Industry is short of space and does not have the technical teams to produce competitive designs. In point of fact one problem the Industry now faces is one of excess production area. Its design teams have been adequate to produce outstanding designs. But as the Government is being extremely reticent about its forward thinking, the future before some of these design teams would be very black if it were not known that the supersonic airliner project, for instance, will require a technical team of a magnitude hitherto hardly envisaged.

Looking ahead to the technical requirements of the future it is not to be wondered at that some forward-looking thinkers foresee the need to group technical resources. Indeed Lord Weeks made this point when talking at the Air League luncheon at the Mansion House some weeks ago. Rear-Admiral Sir Matthew Slattery has discussed the matter in his last two Christmas messages in the Short Brothers house magazine. It is, however, noticeable that the Bristol-Hawker-Siddeley consortium does not merge any existing organization, but adds a new concern. This would certainly integrate action and could be used to streamline the Hawker-Siddeley organization itself but it has yet to be shown that the building of the B.E.A. jet liner requires anything other than co-operative design and manufacturing activity.

How wide of the mark some of the reports have been is shown by the disclaimer issued by the English Electric Company. The statement issued on January 6 said: "There is absolutely no truth in the statement to the effect that an agreement, pact, or arrangement has been made between Vickers-Armstrong and themselves regarding their respective aircraft interests.

"The possibility of co-operation between English Electric and other aircraft firms has been under consideration in recent months and there have been exchanges of views with various companies about this matter but no agreement has been made."

No doubt when Parliament reassembles various questions will be asked about its plans for merging the Industry. We expect the official answers to make it clear that the Government does not have such plans planned. As the Air League has been at pains to make clear, the Government's plan for future demands on the Industry was due long ago.

MATTERS OF MOMENT

Production Progress

FOR the first time there was no snow and no Minister of the Government at the annual conference, staged for the sixth time at Southampton University on January 2 and 3 by the Institution of Production Engineers. But Mr. D. L. Wiggins, chairman of the Southampton Section, and his committee need have no worry about such absentees, neither need they be concerned at the absence of headlines in the daily Press about their confabulations. They have the satisfaction of knowing that what began as a local affair has become an eagerly awaited event in the aeronautical calendar. The permanently overfilled seating accommodation in the university's largest lecture theatre made manifest the enthusiasm of the production engineers of the aircraft industry.

Mr. Wiggins and his committee were fortunate too in their selection of a lecturer to give the Lord Sempill paper. Lord Sempill himself, looking extremely hale, was present throughout and heard Mr. Boyd K. Bucey, vice-president (manufacturing) of the Boeing Airplane Company, give this paper. Mr. Bucey was indeed a tonic. In going out of his way to follow his company's dictum "to share knowledge" he made it quite clear that U.S. aircraft production engineers have much to learn from their British counterparts. We noticed various hard-boiled members of the English technical Press striving to hide unaccustomed blushes at Mr. Bucey's complimentary remarks about their products. Those who read our summary of the Boeing vice-president's paper last week will realize that praise from the author is something to be proud of.

Much interest was taken at the end of the first day's session in the colour film depicting the new Fairey-Ferranti 3-D miller at work. This machine is entirely electronically controlled, using hydraulic mechanism for movement. It works in three dimensions from magnetic tape. The vertical work-table is designed to accept the largest slabs of stretched light-alloy material available and extremely large quantities of chips are removed per minute.

For Sonic Co-ordination

A SPECIAL "Noise Committee" is to be set up by the Aeronautical Research Council to review and co-ordinate the volume of work that is being done by industry, in universities, and in official research establishments, on the problems associated with noise suppression. For the present, this committee exists only as an intention—the next step will be the selection by the A.R.C. of appropriate members (in number as well as by qualification) and the formal constitution of the new group within the Council's jurisdiction.

The subject of noise suppression and reduction is already one of paramount importance. As the new generation of civil transport aircraft with extremely high-thrust engines comes nearer to the operational stage—to say nothing of any supersonic vehicles of the future—the need to co-relate the work that has been done to date, to suggest fruitful lines of investigation and generally to find ways and means of making aircraft powerplants quieter is becoming increasingly urgent. There is plenty for the new Noise Committee to do.

New Year Honours

A SUPPLEMENT to the London Gazette published on January 1, contained the following civil New Year Honours conferred by Her Majesty The Queen. The names of those who received honours in the Service lists were given in our previous issue.

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ORDER OF THE BATH

Knight Commander

H. W. Melville, secretary, Department of Scientific and Industrial Research.

Companions

H. Constant, C.B.E., Director, N.G.T.E., M.o.S.; C. W. Evans, C.B.E., Under-Secretary, M.T.C.A.; J. E. Serby, C.B.E., Director-General, Guided Weapons, M.o.S.

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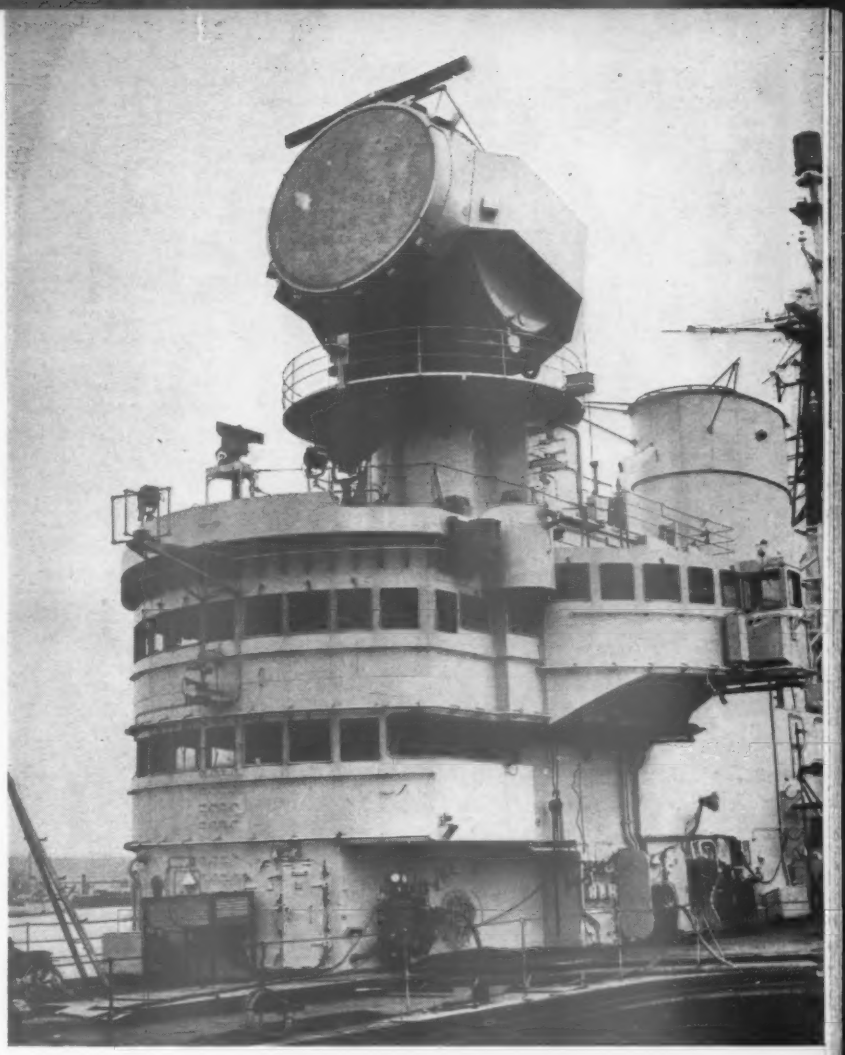

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A. C. Butler, for services in connection with the development of civil air transport in the State of New South Wales; S. E. Jewkes, Acting Assistant Director of Public Works (Roads and Airfields), Federation of Malaya; Capt. R. H. Norman, a member of the Bush Pilots Airways, Cairns, State of Queensland; Capt. R. P. Mollard, managing director, Malayan Airways, Ltd.

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WE have yet to be persuaded that the appointment of an "Overlord," as suggested by the Air League, to ensure the well-being of the Aircraft Industry is the best approach to a problem which is bedevilled by the existence of too many Government departments already. Aeroplanes are necessary

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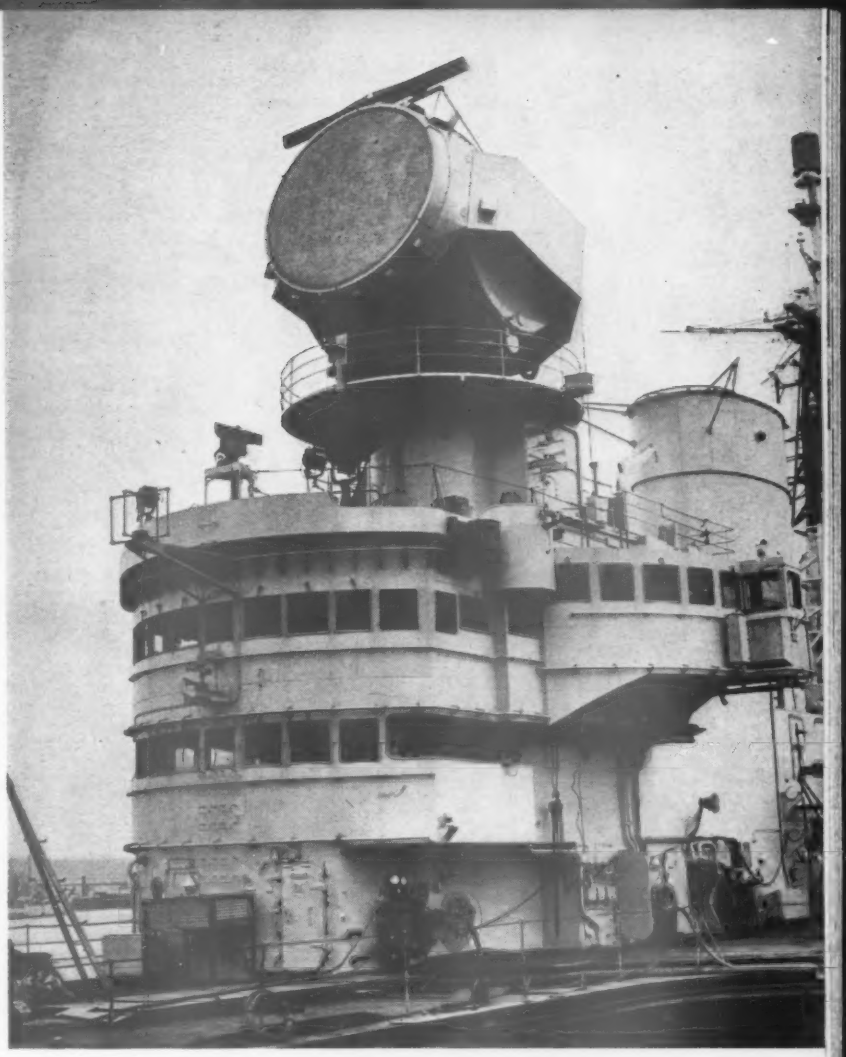

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ELECTRONIC SLAB MILLER.—At the Production Engineers Conference at Southampton last week a colour film was shown of the Fairey-Ferranti 3-D Miller here seen at work on 3-in. thick light alloy slab. (See page 32)

High Hopes for the X-15

NOW UNDER construction at North American Aviation is the X-15 research aeroplane which, it is hoped, will reach a height greater than 100 miles before the end of the year. To be piloted during acceptance tests by Mr. Scott Crossfield, the X-15 will be launched from a mother-plane in the manner of the Bell X-2. After taking delivery, U.S.A.F. Capt. Ivan Kincheloe, who flew the X-2 up to 126,000 ft., will continue the test flying programme.

The X-15 project is a joint undertaking by the U.S.A.F., U.S. Navy and the N.A.C.A. The present budget of $50 million is for two X-15s, with the possibility of building a third if more funds are forthcoming.

If the project goes well, it is intended that the X-15 should be flown as high as 400 miles above the Earth and be used to investigate re-entry problems of manned spacecraft. To do this, North American may use rocket units developed for the now-abandoned Navaho guided weapon.

More About the Exports

FOLLOWING their recent news of the current record total (£99,006,794 up to the end of November) reported in THE AEROPLANE last week, of the exports from our aircraft industry, the Society of British Aircraft Constructors has given some further information concerning the aircraft exported. "At present," says the Society, "exports total just under £100m. for eleven months compared with last year's annual total of £104½m. Orders during 1957 augured well for 1958-59 export trade. Overseas military orders placed for Canberras, Hunters, Gannets, Sycamores, Skeeters, Pembrokes, Sea Hawks, and Vampire Trainers alone totalled almost £100m., while Viscounts (36), Britannias (12), and Vanguards (20, worth £24m.) continue to sell well. Widgeons, Twin Pioneers, Presidents and various types of aero-engines were ordered in quantity by overseas buyers.

"In May, the VC-10 jet airliner was announced by Vickers with an order from B.O.A.C. for 35 of these aircraft. By March, 200 British turbine airliners had been delivered to the World's airlines and by December this figure had risen to some 280. They are still the only aircraft of their kind in service in the Western world."

A New Saro Helicopter

AT A RECENT conference held on the Isle of Wight, Mr. Walter Browning, a director and general manager of Saunders-Roe, Ltd., announced that "a decision" had been made about a new helicopter. This is to be a fresh design and not merely a development of the Saro Skeeter.

No more than this was said, but it would seem possible that the new helicopter might well use certain components of the Skeeter in order to reduce development time and first cost, and it would almost certainly be powered by a shaft-turbine engine in place of the Skeeter's piston-engine powerplant. The most suitable powerplant available in this country is the Blackburn Turboméca Turmo 600 of 450 s.h.p. for a weight of 310 lb., whereas the present D.H. Gipsy Major 215 of the Skeeter weighs 415 lb. and develops 215 b.h.p. Thus it would be logical to deduce that the greatly increased power could best be absorbed by using a new four-bladed main rotor, using virtually standard Skeeter blades mounted in a new hub.

The higher take-off weight would cover the extra fuel required,

for military purposes, there is also a steadily growing demand for them on the air routes of the World. One function of the Minister of Defence is to correlate the claims of the three Defence departments (Air, Army and Navy) and it would be logical for the Minister of Supply to act as umpire between any conflict in requirements between the Minister of Defence and the Minister of Transport and Civil Aviation. If the difficulty is that the Minister of Defence has a seat in the Cabinet and the Minister of Supply has not, then the latter could be upgraded.

Russian VTOL Development

MORE information is now available on the Russian "Flying Bedstead" jet VTOL rig, which was illustrated in our issue of October 25, 1957. In the U.S.S.R., this is known colloquially as the "Flying Motor" or Turbolet, and was designed by a "collective" team under Prof. Doc. Matveyev, its members including Rafaelantz, Kvashnin and Lapshin. The jet rig uses "an ordinary reaction motor" slightly modified for vertical operation, with so-called jet rudders, using compressor air, in place of the control surfaces of conventional aircraft.

The Matveyev VTOL rig has proved fully manœuvrable, after modification, following initial flight trials, and can fly backwards, forwards and sideways, as well as rotate on its axis. Its controls are said to be "similar to those of the MiG-17," and the engine is stated to have the usual JPT and fuel-pressure gauges, etc.

Test flying of the rig has been undertaken by Test Pilot 1st Class U. A. Garnaev, at an Experimental Institute. Garnaev appears to be quite a character, and in addition to routine test flying of military aircraft, helicopters and the VTOL rig, has made several experimental ejections from Il-28s and MiG-15s at speeds up to 900 km.p.h. (559 m.p.h.). He also flew a jet bomber with a new engine for high-altitude tests, and conducted flight refuelling trials at night, over "uncharted territory," with the assistance of radar. Another recent series of test flights were undertaken at supersonic speeds to measure the pressure waves formed round the canopy of a modern fighter.

"A. V." Aeronautical Pioneer

WHEN Sir Alliott Verdon-Roe, O.B.E., died on January 4 in his eighty-first year, there passed one who had been the first Englishman to build and fly his own aeroplane and who from that pioneer stage had lived to see the latest aircraft from the firm of which he was president discarded in favour of an unmanned guided missile. Throughout the whole of his long life he never lost his enthusiasm nor his interest in new ideas.

Born near Manchester in April, 1877, the son of a doctor and one of a family of seven, Edwin Alliott Verdon-Roe received his basic education at a boarding school near Shepperton and later of St. Paul's School. He soon displayed an adventurous spirit, and at the age of 15 he went to British Columbia where a friend of his father, a civil engineer, had offered to teach him surveying. A year later young Verdon-Roe was back in England and apprenticed to the Lancashire and Yorkshire Railway Locomotive Works at Horwich.

At the end of his five-years' apprenticeship he went to work at Portsmouth Dockyard and this association with ships and the sea led him to try and join the Royal Navy. For this he went to King's College, London, to do a course in marine engineering. When it came to the Naval examination at Greenwich, however, although he passed in technical subjects and in mathematics, he failed in the general knowledge paper. Nothing daunted, and still bent on a career at sea, he joined the Merchant Service in 1899.

At this time he became interested in problems of flight and took to studying the gliding birds while he was at sea. He made large numbers of models with varying degrees of success and by 1902 had decided to leave the sea and concern himself with the mechanics of flying machines.

For a while, however, after giving up his marine engineering career, he was a draughtsman in the motorcar industry. During this time the powered aircraft was born and the Wright brothers demonstrated its practicability. Thus in 1906 he finally forsook automobile engineering for aeronautics.

In 1907 he won £75—the highest prize awarded—in a competition for model aeroplanes sponsored by the *Daily Mail*. No less than 200 competitors entered, their models being exhibited in the Agricultural Hall and flown at Alexandra Park. His next aeronautical step was the completion of a full-scale biplane, powered by a 9 h.p. J.A.P. This he started to build in a stable belonging to one of his brothers at Putney and later completed at Brooklands where a prize of £2,500 had been offered for the first flight round the track before the end of that year.

Unfortunately the J.A.P. was not powerful enough to get the biplane off the ground and it was not until the following year when he fitted a 24 h.p. Antoinette engine that Verdon-Roe succeeded in getting his aircraft airborne. This was on June 8, 1908. But although he was quite sure that he had covered a distance of some 75 ft. at a height of 2 ft., witnesses of this achievement could not be found and the Royal Aero Club could not accept it officially as the first flight on British soil. Despite this lack of recognition at the time, there is little doubt now that to Alliott Verdon-Roe goes the distinction of being the first Englishman to leave the ground in his own aeroplane.

Later in 1908, he was forced to give up his shed at Brooklands but was fortunately able to return to Putney where his brother Dr. S. Verdon-Roe again put the stable at his disposal. Here he built his famous triplane which he took to the 1909 Blackpool meeting—only to find that in the prevailing weather it would not leave the ground.

At this time, too, Verdon-Roe was struggling against the inevitable financial problem—to say nothing of difficulties in finding suitable sites from which to fly. In 1910, however, another of his brothers, Humphrey, who had an engineering company in Manchester, decided to give Alliott some financial support and in January of that year the two brothers formed A. V. Roe and Co., Ltd.—the forerunner of the great organization of the same name which is universally known as Avro and is now part of the Hawker Siddeley Group.

Sir Alliott Verdon-Roe at Brooklands in 1954.

After some disappointments with the triplane, of which three were built, the new company's first product was a 25 h.p. tractor biplane, at the end of 1910. This machine achieved the distinction of being the first seaplane to rise off the water in England. A. V. Roe next produced an enclosed monoplane and an enclosed biplane—the latter being entered for the military aircraft trials of 1912 held on Salisbury Plain and later establishing a British duration record of seven and a half hours.

From the 1910 tractor biplane then was developed the renowned Avro type 504, of 1912, with an 80 h.p. Gnôme engine. This subsequently became one of the most outstanding of all aeroplanes; it saw a great deal of service in the First World War, and was used for many years afterwards as a standard training machine. After the War, these contributions to British aeronautics on the part of Alliott Verdon-Roe were recognized by his appointment as an O.B.E. And further recognition of his outstanding achievements came in 1929 when he was knighted.

Before that, however, in 1928, one of the highlights of the year was a banquet organized by the Royal Aero Club, the Royal Aeronautical Society, the Air League of the British Empire, and the Society of British Aircraft Constructors, to commemorate the 20th anniversary of his first flight. (Some 26 years later, that flight was more permanently commemorated by a plaque at Brooklands.) But in 1928, too, there had come a change in the Avro company's fortunes and affairs. The controlling interest was acquired by Mr. John Siddeley (who later became Sir John and later still, Lord Kenilworth) and Alliott Verdon-Roe ceased to be associated with the company that continued to bear his name.

Soon afterwards, however, together with John Lord, another of the founder members of A. V. Roe and Co., Ltd., he obtained a controlling interest in the well-known boat-building company of S. E. Saunders, Ltd., of Cowes, who also made flying-boats. Thus he renewed his close connections with the sea and there came into being the Saunders-Roe company.

The Hawker Siddeley/Bristol Plan

A JOINT statement was made last week by Sir Frank Spriggs of the Hawker Siddeley Group and Sir Reginald Verdon Smith of Bristol Aeroplane Co. giving details of a new company that the two concerns proposed to form in order to undertake a jet airliner to B.E.A.'s specification. The statement recorded that the new company "will be owned jointly by Hawker Siddeley and Bristol in a proportion of 65/35. The object of the company will be to develop as a private venture the B.E.A. airliner and it will be backed by the considerable financial resources of the two parent companies, whose combined assets exceed £200 million.

"The board will consist of Sir Frank Spriggs (chairman), Sir Roy Dobson, Sir Reginald Verdon Smith, Sir Matthew Slattery and Sir Arnold Hall (managing director). Chief engineer of the new company will be Dr. A. E. Russell, who will relinquish all other duties in order to concentrate exclusively on the project."

According to the statement, the design to be undertaken would be the Bristol Type 200, as submitted to B.E.A., "which has already attracted considerable interest among European and American operators." It would use such powerplants as may be specified in the contract. It was understood, in this connection, that B.E.A. preference will be for Rolls-Royce engines.

"The pattern of the engineering work on the Bristol 200, under the direction of the chief engineer, will be broadly on the lines that Hawker Siddeley will be responsible for the structure including stressing, aero-elasticity, control, fuel tanks, etc., whilst Bristol will be responsible for systems, including electrics, hydraulics, air conditioning, de-icing, sound proofing and furnishing. . . . Wind-tunnel and aerodynamic work will be shared according to the appropriate facilities."

NEWS OF AIRCRAFT, ENGINES AND MISSILES

TILTING WINDMILLS.—First pivot-wing VTOL aeroplane to fly, the Vertol Model 76 is powered by a Lycoming T53 shaft-turbine.

MISSILES AWAY.—Britain's rocket missiles, Sea Slug for example, are now available for sale to foreign buyers. This point was made by Sir David Eccles, President of the Board of Trade, in San Francisco on January 2. He was on his way to Mexico and Venezuela to look into British trade prospects.

INDIAN OTTERS.—Delivery began at the end of 1957 of 26 Otters from de Havilland Canada to the Indian Air Force. The order is worth $3 million, and is due for completion in July this year. Otters have also been ordered by the Norwegian Air Force, and are already in service with the R.C.A.F., the U.S. Army and the Chilean Air Forces.

RUSSIAN RECORD.—According to the newspaper *Red Star*, the Commander of a Russian fighter squadron, Maj. Mikhailik, recently flew a standard jet fighter of unspecified type to an altitude of more than 62,336 ft. The climb was said to have been made almost vertically, and the aircraft "easily overcame the sound barrier."

LOCKHEED PLANT.—Work has begun on the construction of the Lockheed Missile Systems Division Polaris Development Facility, which is being built in California. The building, costing $3 million, covers 13 acres and is due to be completed by July 1. It will house testing facilities and engineering and planning departments besides the administrative section for the U.S. Navy's top priority Polaris underwater-launched IRBM project.

MORE PIONEERS.—R.A.F. contracts for the Scottish Aviation Twin Pioneer have been increased from 20 to 32. The total military order, including spares, is valued at about £2 million.

NEW SIKORSKY.—Using rotors, transmission and gearboxes of the S-55, the Sikorsky S-62 will have a flying-boat hull and float fairings over the main wheels, thereby dispensing with emergency flotation gear. Powerplant is a G.E. T58 and payload will be 700 lb. greater than the S-55's 1,300 lb.

MORE CRUSADERS.—In addition to a $200 million order for the F8U-2 Crusader, Chance Vought Aircraft have received a contract worth $100 million for initial production of the F8U-3, an advanced all-weather version for the U.S. Navy, powered by a Pratt & Whitney J75 turbojet instead of the J57 of the F8U-2.

NEW CESSNA.—The Cessna Aircraft Co., of Wichita, has announced the addition of a sixth aircraft to its present production. Known as the Skylane, the new aircraft is styled on the Model 182 and has the nosewheel "Land-O-Matic" landing gear. It is to cost $16,850.

SATELLITE SYSTEM. — According to *Aviation Daily*, the U.S.A.F. is going ahead with the WS-117L aerial reconnaissance system to be produced by Lockheed. The original name of "Pied Piper" for this satellite-type system has been dropped in favour of a new and as yet undisclosed name.

HELICOPTER HEIGHT.—A Cessna YH-41 of the U.S. Army is claimed to have set a new helicopter height record of 30,335 ft. The pilot, Capt. James Bowman, has been awarded the American D.F.C.

WINNING GRUMMAN.—A U.S. Navy design competition for an attack aeroplane has been won by Grumman. Layout is for a turbojet-powered two-seater designed for both low- and high-level operation.

BELGIAN CANUCK.—First photograph of a Belgian Air Force Avro Aircraft CF-100 Mk. 5, which recently arrived from Canada. It has the standard NATO camouflage.

COMMERCIAL AVIATION AFFAIRS

FLYING SAFE.—According to C.A.B. figures, the accident rate of the U.S. airlines in 1957 was lower than one fatality per 100 million passenger-miles. Motoring accidents in 1957 killed six people per 100 million passenger-miles.

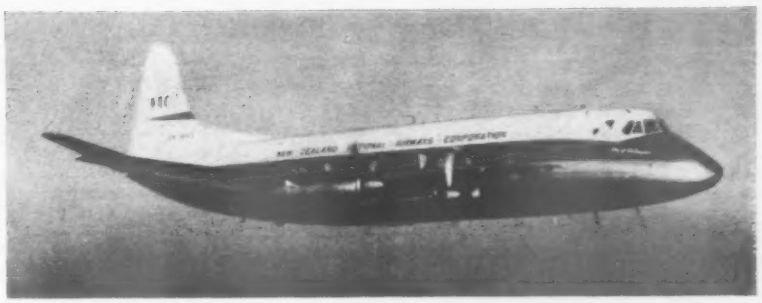
ANSETT VISCOUNTS.—Ansett-A.N.A. announced last week that it plans to purchase four Viscount 810s for service from the end of this year. Four Electras, already on order, will be coming into service with Ansett early in 1958.

FAST BRITANNIAS.—A Bristol Britannia 302 of Aeronaves de Mexico flew from Mexico City to New York in 5 hr. 8 min. on January 1—the fastest time recorded on this route. There were 61 passengers on board. A B.O.A.C. Britannia 312 flew from New York to London in 7 hr. 57 min. on January 6.

INDEPENDENT TOURISM. — Air work and Hunting-Clan began operating their Viscount Safari tourist class services to West Africa on January 6. The service, which is the first regular intercontinental tourist-class service to be worked by a British independent airline, is being flown once a week in each direction between London Airport and Accra, with stops at Lisbon, Las Palmas (night stop), Bathurst and Freetown.

MORE BOEING 720s.—Mr. W. M. Patterson, president of United Air Lines, has said that by 1965 his airline plans to purchase 51 Boeing 720 medium-range turbojet airliners. An option on 19 was taken when the first order for 11 was placed, and further orders will probably be placed each year. United plan to introduce Boeing 720s in 1960, on routes such as Seattle-San Francisco and Seattle-Los Angeles.

I.A.T.A. MEMBER.—Quebacair Inc. of Rimouski, Quebec, has been admitted to associate membership of I.A.T.A. There are now nine associates and 72 full members of the association.



The first of three Vickers Viscounts for N.Z.N.A.C. left London Airport on January 1 for New Zealand; they will go into service on the Christchurch-Auckland route in February and will be the first turboprops in service in New Zealand.

CARTER BURGESS RESIGNS.—After a little less than a year in office, Mr. C. L. Burgess resigned as president and director of T.W.A. on January 1. A statement said the airline's board had accepted this resignation "with regret," and spoke of "disagreement over airline policies" between Mr. Burgess and Mr. Howard Hughes, principal shareholder in T.W.A.

AER LINGUS TRAFFIC.—In 1957, Aer Lingus carried 450,000 pasengers and 8,000 tons of freight and mail on 17,931 revenue flights.

FLYING-BOAT LOSS — A Short Sandringham (LV-AAR) of Aerolineas Argentinas sank while making an emergency landing in Buenos Aires harbour on December 31. Eight passengers and the purser are reported drowned; the other 40 occupants were rescued.

NEW MONTREAL BASE.—T.C.A. plan to construct an overhaul and maintenance base at Montreal for their turboprop and turbojet fleets. Contractors will begin this year and completion is planned by the end of 1959, in time for the facility to be used by T.C.A.'s 20 Vanguards and six DC-8s. Viscount and Dart overhaul will continue at Winnipeg.

ATLANTIC TELETYPE. — T.C.A. have inaugurated the first airline teletype circuit over the North Atlantic, providing a direct link between Montreal and London Airports. The privately leased channel will replace the present system of routing the bulk of T.C.A.'s communications via New York and Paris.

T.C.A. TRAFFIC.—In 1957, T.C.A. carried an estimated 2,375,000 passengers, a 16% increase over 1956. There was, however, some evidence of a weakening demand in the latter half of 1957 which is causing the airline some concern.

AMERICAN RECORD. — During 1957, American Airlines, the largest U.S. domestic operator, carried over eight million passengers and flew more than 5,000 million revenue passenger miles. The company flew over 85 million ton/miles of freight in the same period.

NO LIVING-ROOM LOOK.—American Airlines' plan to feature the "living-room look" in their fleet of Electras (see THE AEROPLANE, December 27, p. 955) has been abandoned. *Aviation Daily* reports that the arrangement proved too inflexible and American Airlines will now use a simple 68-seat layout with four-abreast seating and an 8-in. table on the centre armrest between each pair of seats.

CARAVELLE AUTOPILOTS.—The Lear L-102 miniaturized autopilot has been adopted as standard in the Caravelle. Orders to a total value of $1.5 million have been placed by Sud-Aviation with Lear.

TRAFFIC DOWN UNDER.—During 1957, more than two million travellers passed through Sydney and Melbourne airports. Movements at the two airports, respectively, totalled 58,000 and 50,000.

I.C.A.O. MEMBER.—Tunisia has become the 72nd member State of I.C.A.O.

NEWS ABOUT PEOPLE

ALMIN CHANGES.—Mr. W. Brining, A.C.A., has relinquished his appointment as secretary of Almin, Ltd., of Stoke Poges, which he has held since the company was formed in 1945. He continues as a director of the company, and of its subsidiaries, Southern Forge, Ltd., Warwick Production Co., Ltd., Aero Controls, Ltd., Pressoturn, Ltd., and others. He is succeeded as secretary of Almin, Ltd., by Mr. A. E. Roe, A.A.C.C.A., who had been assistant secretary since 1952. Mr. Spence Sanders retired from the board on December 31 and has relinquished his directorships of the company's subsidiaries. He continues with the Group as group consultant.

HELLERMAN PERSONNEL.—After serving for several years on the board of Hellermann, Ltd., a subsidiary of Bowthorpe Holdings, Ltd., Mr. H. R. Whyte, A.M.I.E.E., has been appointed technical director. A newcomer to the board of the company is Mr. C. E. D. Catley, who becomes works director. Other appointments are Mr. S. E. Downer as manager of the Cable Accessories Division, Mr. P. Steer as manager of the Plastics Extrusions Division; and Mr. P. Bowthorpe to be assistant sales manager.

C.A.I. POST.—Newly appointed assistant secretary of the Canadian Aeronautical Institute is Wg. Cdr. H. L. Taylor, who retired recently from the R.C.A.F. after 29 years' service.

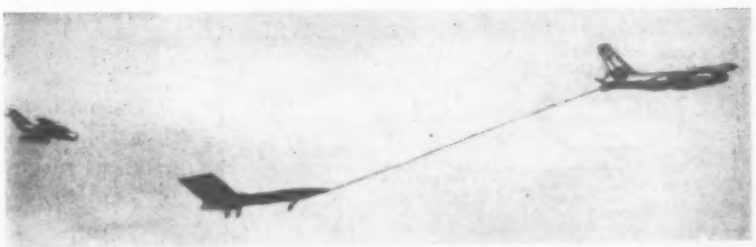
VICKERS AWARDS. — The 1958 Vickers-Armstrongs (Aircraft), Ltd., Scholarship award has been made to 19-year old Neville Brenchley, who also receives the Undergraduate-Apprentice award. He is at present at the Apprentice Training School at Weybridge.

SECOND TERM.—At the annual meeting of the Aluminium Industry Council held in London in December, 1957, Mr. H. G. Herrington, C.B.E., managing director of High Duty Alloys, Ltd., was warmly thanked for his services to the industry during his year as chairman of the council and was unanimously re-appointed to serve a second term.

BRISTOL CHANGES.—Left, Mr. J. F. Harper, appointed assistant managing director of Bristol Aircraft Ltd. He is succeeded as secretary of the Bristol Aeroplane Co., by Mr. J. W. Reader Harris, right.

DECCA DIRECTORS.—New appointments to the board of Decca Radar, Ltd., are Mr. C. L. Taylor (marine manager); Mr. M. H. Easy (chief development engineer), and Mr. H. C. Lambert (comptroller). All have been with the company since 1950.

APPOINTMENT IN LONDON.—Mr. William M. Garven has been appointed district sales manager of T.C.A. in London. He has previously occupied a similar position in Edmonton, Alberta.



RUSSIAN TARGET.—The delta-winged PM-3J towed target used by Russian fighter squadrons, and towed here by an Il-28.

AIR TRANSPORT

The Short-haul Jet

LATEST developments in the bid for a contract from British European Airways for a production batch of short-range turbojet transports, as known to us at our press date, are discussed in the Leader in this issue. Writing on this page last week we recorded that three designs had been submitted to B.E.A. for a final choice to be made—by Avro, Bristol and de Havilland. Subsequently, it became clear that the joint proposal by Avro and Bristol in effect eliminated the Avro 740 project, since the new joint company which is to be formed if the order is forthcoming (see page 35) will produce the Bristol 200.

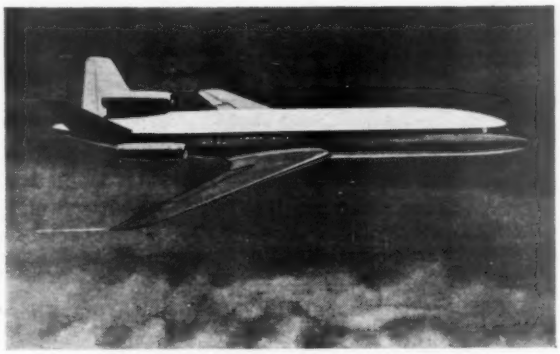
A meeting of the B.E.A. board was held on January 3 to consider the new situation in which development of both the Bristol 200 and the de Havilland D.H.121 was being backed by private finance. The following statement was made at the end of this meeting: "The B.E.A. board has discussed the question of the new B.E.A. jet airliner and is holding further consultations with the Ministry of Transport and Civil Aviation."

Until the final choice is known—as it may be by the time these words appear in print—neither Bristol nor de Havilland wish to provide details or illustrations of their project. The artist's impression of the Avro 740 on this page serves, however, to show the kind of arrangement adopted by the other companies, with a moderate sweep-back on the wing, located far back on the fuselage, and a cluster of three turbojet engines at the rear. The Avro arrangement, featuring a butterfly tail unit, has not been used by Bristol and de Havilland, however, who have located the intake to the third engine in the base of the fin—combined, perhaps, with a T-tail.

These aircraft provide accommodation for about 70 passengers in normal layouts and up to 100 with high-density seating, and are designed to cruise at 600 m.p.h. or more at a moderate cruising altitude. B.E.A. have asked for a full-payload stage-length of approximately 1,000 miles, but to make the aircraft more attractive to other potential customers both Bristol and de Havilland are likely to have made provision for considerably greater tankage—sufficient perhaps for a still-air range with reduced payload of not less than 3,000 miles.

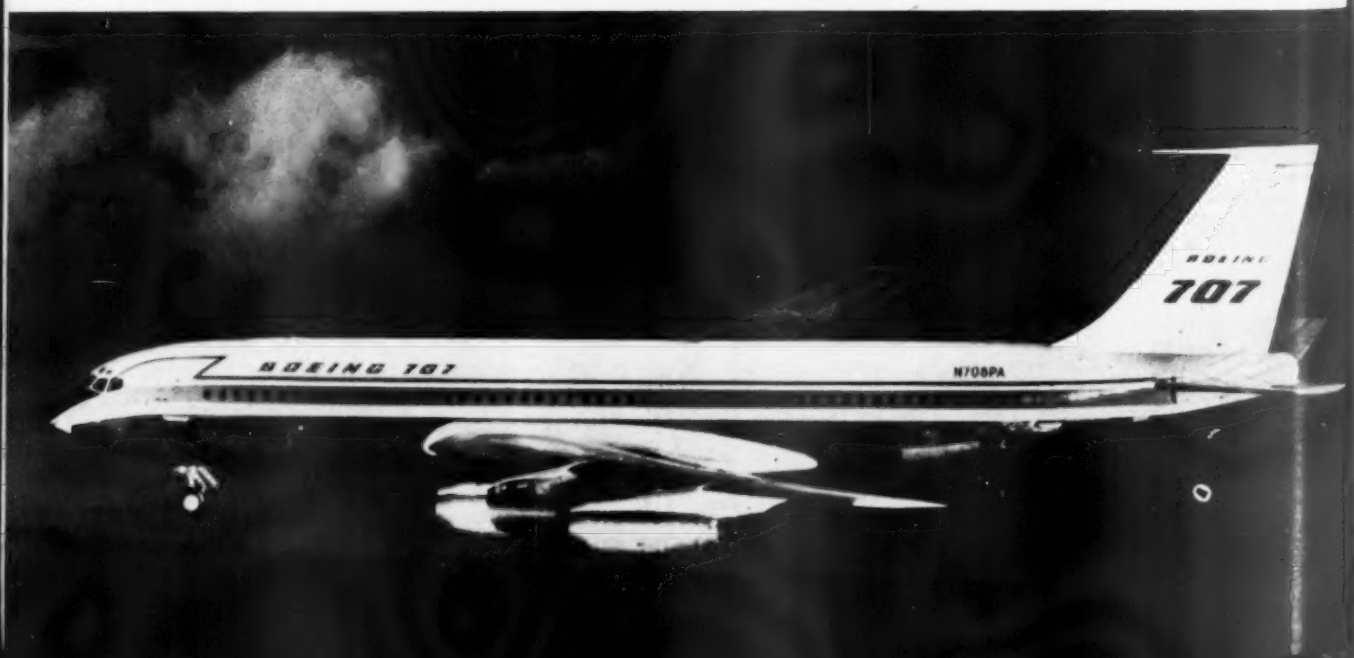
Although the B.E.A. order—for about 20 aircraft—is regarded by the companies concerned as a prerequisite to development of this short-medium haul turbojet, its ultimate commercial success depends, obviously enough, on overseas orders. By their willingness to start development on the basis of the B.E.A. order, therefore, Bristol, the Hawker Siddeley Group and de Havilland are all tacitly admitting that they consider the prospects of selling such an aeroplane in quantity to be good. This being so, it might be asked why development has not already started, since financial arrangements to meet the costs have now been made.

There seems little doubt that whichever aeroplane is eventually built, it will be able to offer lower operating costs than any turbojet transport announced so far. Its nearest competitor is probably the four-engined Boeing 720, which is designed for ranges of 400 to 2,000 miles but will be considerably larger and heavier—and have a less attractive take-off performance. Boeing have a smaller turbojet project in the 727, and Douglas have been studying various projects in the same class under the designation DC-9. If the B.E.A. order starts another buying snowball comparable to that which followed the P.A.A. purchase of Boeing 707s, the American manufacturers can be expected to go into production and, starting now, could probably offer delivery by 1963 at the latest. For the British project to be a World success, therefore (and not just a successful aeroplane), it is vital that work should begin at once—and that the 1964 service date specified by B.E.A. should be bettered.



The Avro 740 short-haul turbojet project.

BOEING GOING.—Another picture of the Boeing 707 on its first flight, from Renton to Seattle, on December 20. Three flights were made before Christmas, including one of 91 minutes' duration on which the 707 reached 300 knots and 18,000 ft.



Impressions of the New Idlewild

NO drawing, photograph, or description can really do justice to New York International Airport's new terminal building, or to the concept of the "terminal city" of which it forms a part. The size of this building and the extent of the land forming the central terminal area are much greater than can easily be visualized by anyone who has not actually seen them.

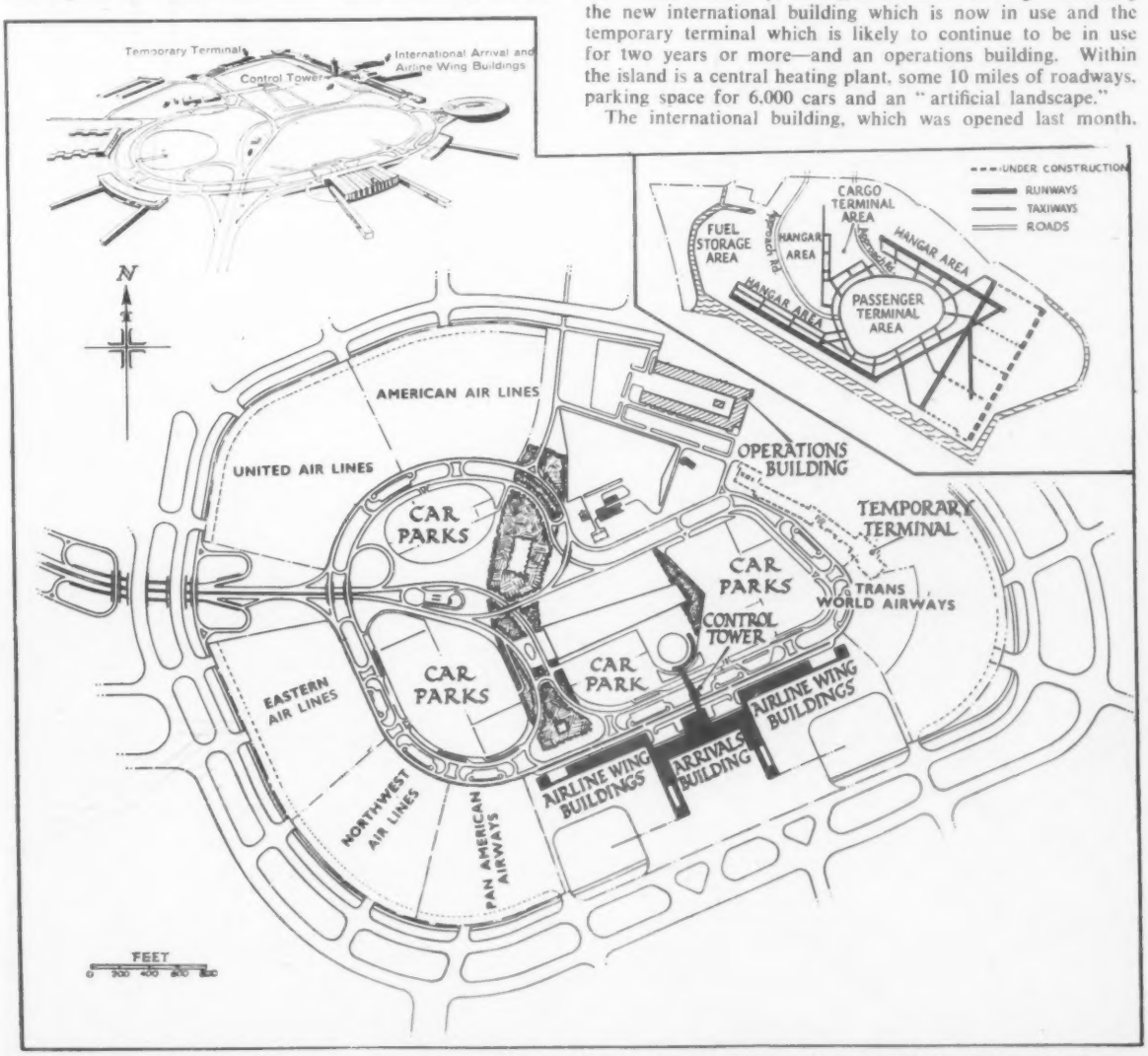
Rather more than 14 months ago (in THE AEROPLANE of August 24, 1956) we described the overall system of New York's airports and the plans for the development of Idlewild. At that time there was nothing very much in the way of full-scale work to be seen—apart from the control tower, which was brought into use in 1952—but a large model of the terminal area (used by the Port of New York Authority to plan the various facilities) provided the visitor with a good general idea of the total concept.

Even the photographs of the 2,300-feet-long terminal building (reproduced in the issue of December 6 last) could not really give scale to this gargantuan affair—or to the artificial, floodlit landscape of the "island" behind it. In order to appreciate it one has to move as a passenger through the new terminal's arrivals building—and out again from the departure buildings.

For the benefit of those who may not have seen earlier descriptions and pictures of the building and the terminal area, it might be as well to recapitulate the salient facts about the development of New York International.

The plan involves an island terminal area which forms the centre of taxi-track and semi-tangential runway systems which are already in existence. The area is reached by main and subsidiary approach roads which enter at the "open" side of the runway system and which pass under the taxi-tracks encircling the area. Around the perimeter of this central island, there will, eventually, be eight terminal buildings—including the new international building which is now in use and the temporary terminal which is likely to continue to be in use for two years or more—and an operations building. Within the island is a central heating plant, some 10 miles of roadways, parking space for 6,000 cars and an "artificial landscape."

The international building, which was opened last month,



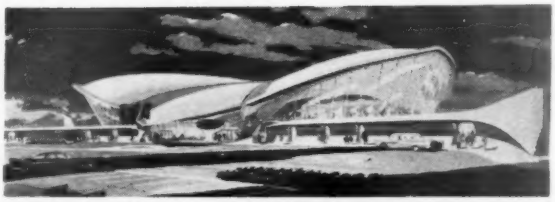
This plan of Idlewild's central area shows the positions of the international and unit terminals and the relationship of the area to the main layout of the airport. Left, above, is a perspective sketch of the area as it will appear when all the terminals are completed.

is used, and will continue to be used, only for international arrivals and for departing foreign flag airline traffic. The ground floor in the central part of the building and in the two arcades (which are far too commodious to be called "fingers") are used by international (both foreign flag and U.S. carrier) traffic arriving at the airport.

The travellers walk along the arcades, in which there are health and Immigration departments, and into the ground-floor Customs hall which, in two halves, extends over most of the length of the central part of the building. There they join their baggage, claim it from a rack and carry it (or wheel it on the trolleys provided) to one of 32 Customs counters, each complete with a short conveyor belt, and a desk for the Customs officer. At present only the eastern half of the Customs hall is in use and officials and porters are on duty in numbers according to the amount of the expected traffic.

The public and the travellers' friends (who will have been directed to the first floor of the arrivals building) are able to look down at the arrivals (as at goldfish) through glass walls, and to join them as they leave the Customs hall. The first and second floors (using the British meanings for these terms) of the arrivals building are laid out primarily for the benefit of the general public, who will normally reach the building at the first floor via a promenade which passes through the control tower from a ramp leading out of the car parking areas. There is an observation deck along the whole length of the second floor on the airport side and along each arcade.

Passengers leaving by the air services of any one of the 20 foreign flag airlines with facilities in one of the two wing buildings (or by any other airline using the consolidated airline office in the west wing) enter the appropriate ticket office at the ground floor and, after processing, go to the first floor lounges to await their calls. On departure, they walk along the arcades on the first floor before descending at the announced gate for their aircraft. Departing passengers flying with a U.S. international carrier will continue to use the temporary terminal until such a time as the U.S. airlines' unit terminals have been built around the perimeter of the central area.



Of the unit terminals planned for Idlewild, that devised by T.W.A. is nothing if not original in its architectural conception.

These terminals—on sites (taken clockwise from the international building) leased to Pan American, Northwest, Eastern, United, American and T.W.A.—are likely to give Idlewild a strangely amorphous appearance, since their individual designs have been left entirely to the carriers concerned. Whereas the foreign flag carriers in the wing buildings of the international terminal have been allowed freedom to plan their own décors and layouts within the space available and within the overall plan for arriving and departing passengers, the U.S. carriers have been permitted to use all the imagination they cared to apply to the leased sites.

So there are futuristic devices, like the T.W.A. and P.A.A. terminals, at one extreme and more normal buildings, like that of United, at the other. The sketches on the previous page show the disposition of these unit terminals and the shape of the P.A.A. building—but T.W.A.'s can only be demonstrated

The aerial view below shows the whole of the central area at Idlewild, as it appears at present, with the international terminal building in the left centre foreground and the old temporary terminal on the extreme right. The two principal U.S. international operators, P.A.A. and T.W.A., will have their own unit terminals respectively to the left and right of the 2,300-foot long international building.

by the use of a separate artist's impression which is reproduced on page 40. The main feature of the P.A.A. terminal is the circular cantilever roof extending over the apron. T.W.A.'s building will be a shell concrete structure designed to suggest "the flight of a giant bird" with four interacting vaults separated by bands of clear-glass skylighting and with its two main lateral vaults rising upon deep glass walls.

Goodness knows what all this is going to cost the airlines. The interiors of the wing buildings leased to the foreign carriers have, it is believed, cost these airlines something like a millon dollars overall. These departure centres have certainly, by and large, been effectively furnished and a few, notably Air France, B.O.A.C. and Sabena, have excelled themselves in giving air transport an atmosphere of luxury which has tended to be lost during the past few years.

However, to turn finally to more practical aspects of the new Idlewild, the whole project is designed to serve more than 11 million passengers a year by 1965—more than three million of them on the international services. There are, on the international building apron, standings for 24 aircraft and, when the unit terminals have been completed, there will be provision, in all, for 140 standings. At present there are four runways in use. A second NW/SE instrument runway (shown with a broken line in the drawing on p.39) is now being constructed.

Britannia Withdrawal for Modification

SO that engine modifications can be completed, B.O.A.C. have discontinued one of the Britannia London-Singapore-Hong Kong services for a period of six weeks and the London-Aden Britannia service for four weeks.

The withdrawals have been planned so that aircraft can be made available for the work involved in the modification of Proteus 705 engines in all the units of the Britannia 102 fleet. The modification concerns the cleaning-up of the intake areas as a part of an interim programme for reducing the icing troubles, of which the installation of automatic re-light glow plugs formed an earlier stage.

The intake modifications involve the provision of an alternative supply of cooling-air for the alternators and include work on the intake to permit the later completion of the "air-blowing" anti-wet-ice modification. The service suspension has been necessary in order to make certain of meeting a target date for the modification of all powerplants—a date presumably related to the monsoon period on the Eastern routes.

A B.O.A.C. Resignation

AS we briefly announced in last week's issue (page 6), Mr. A. C. Campbell Orde, development director of B.O.A.C. has relinquished his appointment with the Corporation and will, we understand, act as a private consultant in aviation matters.

Mr. Campbell Orde, who has been with the Corporation since its formation in 1939 and was previously, from 1936 to 1939, with British Airways, has been associated with British aviation since 1919. He was then, on leaving the R.A.F., one of the first airline pilots and flew for Aircraft Transport and Travel before leaving the country to be civil aviation instructor with the Chinese government. From 1924 to 1936 he was a test pilot with Armstrong Whitworth.

During the last war he was operations director of B.O.A.C. and, later, the Corporation's liaison officer with R.A.F. Transport Command. He was a member of the 1943 Brabazon Committee and, after a period as assistant to the Corporation's chairman, Lord Knollys, was (in 1946) put in charge of B.O.A.C.'s technical development work—with which he has been concerned until his resignation at the turn of the year.

French-U.S. Talks Break Down

A BRIEF communiqué was issued in Washington at the end of last month concerning the bilateral air talks which have been going on between France and the U.S.A. This said that "The two delegations, after having carried out a wide exchange of views in a spirit of mutual understanding, were unable to arrive at an agreement. Under these conditions they have agreed to separate with a view to consulting their respective governments in soliciting new instructions."

According to unofficial but reliable sources, the delegations are very far from agreement and the possibility that France will denounce the 1946 bilateral has not been ruled out. The discussions have been concerned primarily with the Air France desire for a route to the American west coast, but other new routes are also being sought by France including one from Tahiti to the west coast via Honolulu, which would be operated by T.A.I., and a link for U.A.T. from French African territories to Miami via Dakar. The request for these new routes was timed to coincide with the introduction of the American trans-arctic services to Paris from the West coast, permission for which was granted by France with great reluctance.

The French position in these talks is weakened by the fact that the U.S. wants little from France, although the traffic routes between Paris and most other European cities which, reportedly, were requested, would be useful to P.A.A. and T.W.A. Under the terms of the 1946 agreement, French carriers can fly from any point in France to specified cities in the U.S.A., while American carriers can fly from any point in the U.S.A. to specified cities in France.

ELECTRA AIRBORNE.—The Lockheed Electra, first flown on December 6, 1957, is now engaged in initial handling and take-off tests preparatory to the beginning of C.A.A. certification trials. A full description of the Electra appeared in THE AEROPLANE for December 27.

Middle East Air Transport—1

At a time when the Middle East is the centre of so much political attention this article dealing with air transport in the area is of special interest. To be concluded next week, it has been contributed by VICTOR L. G. GORE.

THE countries on the fringes of the Eastern Mediterranean have been the classic highway of commercial intercourse of various civilizations of the ancient world. A large part of the camel and ship-borne commerce of that world pivoted around this area, to which in modern times the Canal, the oil pipe-lines and air transport have once again restored this traditional function.

A curious cycle can thus be observed: first, the caravan routes tied to the *khans*, then the sea-borne traffic and now, again, a shift in the alignment of trade routes from the sea to the land, to the airport-based transcontinental air routes which today bisect the region.

Already before the last War the function of the Middle East in international air communications was firmly established; vital air routes linking three European powers—Britain, France and Holland—and their distant overseas dependencies, met in this area and air services of other European countries converged upon it. The War brought an unprecedented development of ground facilities and peace found the region well equipped with numerous airfields and installations, and with inhabitants more than ever conscious of the usefulness of air transport.

Some of the war-built facilities have been put to civilian use, pre-war installations have been enlarged and a substantial number of international and intercontinental routes once again converged on this area. Air services of Belgium, Britain, France, Germany, Holland, Italy, Scandinavia, South Africa, the U.S., India and Pakistan, and a number of other flags, touch down in one or the other of the Middle East countries. In fact, today, this region is perhaps better served by air transport than other higher-developed areas of the World.

The place of prominence as a junction of these international services spanning the Middle East, long held by Cairo, has been sharply contested during the past few years by Beirut. In 1954 Cairo topped the list of Middle East air-traffic centres, being linked to a network of international routes of some 220,000 km. and connected by direct services to 78 localities in the World—of which, incidentally, 19 were in Africa. Beirut held the second place, being connected to a somewhat more modest network, but with direct linkage to 69 localities in the World. Of these, 31 were in Asia and Australasia—an illustration of Beirut's more natural function as a port of entry to the Asiatic continent and beyond.

Although international airlines appear to have been remarkably slow in their appreciation of the shifting political scene in the Middle East and of the consequent need for placing the centres of their operations in that area on safer grounds, the xenophobia of Egypt's new rulers and their politics appear to have been a more readily understood warning signal than previous occasional incendiarisms of foreign aircraft. By contrast, the liberal air policy of the Lebanese Government, the absence of any anti-West complexes, a free economy and the improvement of terminal facilities in Beirut, are gradually paying off handsome dividends by making Beirut the most important air transport centre in the Middle East.

Lydda's natural position as a gateway to the Asiatic continent has been much prejudiced by a combination of factors, some within and some without the control of Israel. Air transport communications between Israel and the neighbouring countries ceased during the 1948 hostilities leading to the establishment of the State, never to be resumed. During that period, international airlines also withdrew their operations and, as only the sea and air remained open, Israel had to make *ad hoc* arrangements with irregular air carriers. Born from this experience was the acute local consciousness of a need for a national-flag operation which could maintain the country's life-lines of communications irrespective of changing political or military conditions.

Whilst operations of international carriers to Israel had restarted soon after the new State had asserted itself, Arab states have unceasingly tried to browbeat such airlines into supporting their anti-Israel economic boycott; these efforts included threats of reprisals against the operations of such carriers to Arab countries if their services were not to be withdrawn from Israel.

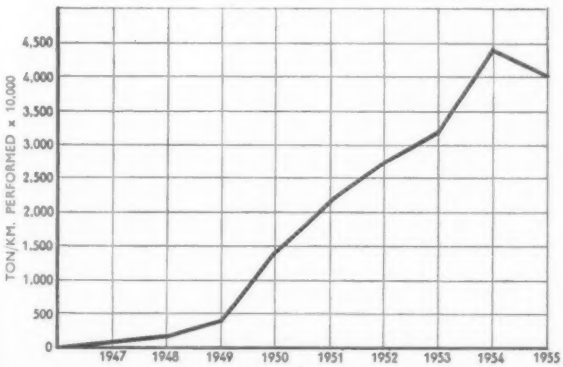
Conditioned by the economic difficulties encountered in the new State, by the absence of a crystallized Government air policy and authority, and by the rough-and-tumble of competitive relations with the national carrier, international airlines,

El Al Israel Airlines, although one of the youngest Middle East airlines, is already one of the most successful and is the only one flying on the North Atlantic route. Some of the El Al fleet is shown here at Lydda Airport.

Istanbul, on the boundary of the area covered by this article, has been much used in the past year as an alternative to Cairo. It is also the terminal of one of the longest routes flown by B.E.A., one of whose Viscounts is seen here at Istanbul (Yesilkoy) Airport.

with some notable exceptions, have been somewhat too prone to meet halfway these Arab threats by curtailing their operations to and through Lydda. In consequence, the number of international services terminating or passing through Lydda had shrunk considerably, so depriving it of an important pre-war position as an air junction and, for the time being, of some of its prospects.

The reason for the close knitting of the international air network over the Middle East is its geographical location athwart convenient intercontinental routes and vital air arteries and at a touching point of the three huge masses of populations of Africa, Asia and Europe. In recent years the Middle East



The rapid rise in traffic carried by all the Middle East airlines is shown in this graph.

region experienced an intensive development of its own air transport operations spreading across its vast expanses and gradually reaching out farther afield.

This progress of intra-regional air transport was largely due to a number of favourable conditions. Within living memory the journey from Baghdad to the Mediterranean coast has been by camel and took 14 days, and the journey from Jerusalem to the coast took one whole day. Although, during the past 25 years, surface communications have been considerably improved, Middle East countries are still poorly provided with railways and roads. In relation to their size, they have fewer roads than Eastern Europe and, relative to their populations, they fall well below Eastern Europe or Latin America. Density of the railway network is lower than in pre-war Eastern Europe and, relative to the size of population, the Middle East countries are worse off in the matter of rail services than most Latin-American countries.

For each square kilometre of cultivated area there are only eight kilometres of roads in Syria, three in Turkey and two in Iraq. The position is somewhat better in Cyprus and the Lebanon, the ratio for each being 45 kilometres, and in Egypt, where the figure is 25.

Finally, limitations of transport facilities are reflected in the number of people employed in such services. While 9% of the total labour force in Norway is engaged in transport and communications, only 1.5% of the labour force is so engaged in Turkey, 2.3% in Egypt and 5% in Israel.

Within the region, the main centres of concentration of economic activity and political administration—that is, the traffic-generating centres—are mostly separated from each other not so much by distance as by stretches of desert or water, or both, so favouring the establishment of air communications. Thus, very considerable time savings are effected by air transport: Baghdad-Jerusalem, for instance, a surface journey of about 26 hours, or Baghdad-Damascus, a surface journey of some 21 hours, can be effected by air in 3½ hours and 1 hour 10 minutes respectively. Travel time from Baghdad to Ankara was slashed by scheduled air transport to some four hours instead of the 72 hours required by overland train journey. Whilst a whole night's journey by boat is required from Cyprus to Israel, an aircraft does it in slightly over one hour.

It is therefore natural that intra-regional air transport has shown, in the past few years, a steady progress. At present nine operating companies (excluding Saudi Arabia) provide scheduled domestic and intra-regional services, and the total of unduplicated route-miles operated by the scheduled airlines of Cyprus, Egypt, Iraq, Israel, Jordan and Lebanon grew from 10,108 miles in 1946 to some 54,000 route-miles in 1956-7.

(To be concluded)

Passengers arrive at Lydda Airport in an El Al coach.

THE FIGHTING SERVICES

R.A.F. Promotions

IN THE half-yearly promotion list which took effect on January 1, the Air Ministry announced that Air Chief Marshal Sir Dermot Boyle, Chief of the Air Staff, has been promoted to the rank of Marshal of the Royal Air Force. As the first graduate of the R.A.F. College, Cranwell, to be appointed Chief of the Air Staff, Sir Dermot Boyle now has the distinction of being the first Cranwell cadet to become a Marshal of the R.A.F.

Air Vice-Marshal E. C. Hudleston, Vice-Chief of the Air Staff, and A.V.M. H. A. Constantine, Deputy Chief of Staff (Plans and Policy), SHAPE, have been promoted to the rank of Air Marshal. Air Cdre. G. A. Walker, Air Officer Commanding, No. 1 Group; Air Cdre. W. E. Oulton, Senior Air Staff Officer, Coastal Command; Air Cdre. J. Worrall, Air Officer in Charge of Administration, Flying Training Command; and Air Cdre. D. W. R. Ryley, Director of Armament Engineering, Air Ministry, have all been promoted to the rank of Air Vice-Marshal.

Air Chief Marshal Sir Dermot Boyle, G.C.B., K.C.V.O., K.B.E., A.F.C., who has been promoted to the rank of Marshal of the Royal Air Force with effect from January 1. He has been Chief of the Air Staff since January 1, 1956, and prior to that was A.O.C.-in-C., Fighter Command.

Fleet Air Arm Promotions

INCLUDED in the half-yearly list of confirmed Naval promotions announced by the Admiralty on January 1, are the following Fleet Air Arm officers:—

Commander M. F. Fell, D.S.O., D.S.C., at present commanding H.M.S. "Puma" and formerly the first Cdr. Air of H.M.S. "Ark Royal," and Cdr. C. K. Roberts, D.S.O., Cdr. Air at R.N.A.S. Eglinton, have been promoted to the rank of Captain.

Lieutenant Commander R. W. Kearsley, Lieut. Cdr. Flying, Merryfield; Lieut. Cdr. C. E. Price, A.F.C., Air Warfare Division, Admiralty; Lieut. Cdr. J. P. David, formerly C.O. of No. 815 Squadron; Lieut. Cdr. R. L. Eveleight, D.S.C., formerly C.O. of No. 802 Squadron; Lieut. Cdr. D. K. Steer, A.F.C., Lieut. Cdr. Flying, H.M.S. "Albion"; and Lieut. Cdr. J. D. Russell, formerly C.O. of No. 800 Squadron, are promoted to the rank of Commander.

R.A.A.F. Antarctic Flight

FOLLOWING the extreme difficulties that R.A.A.F. pilots have experienced in locating ground parties in the snow, the two D.H. Beavers operating with the 1957-58 R.A.A.F. Antarctic Flight have been equipped with SARAH receivers. All ground parties operating away from their home bases will be issued with SARAH transmitters to assist pilots to locate them for aerial supply drops by the normal homing method employed for air/sea rescue work.

The Antarctic Flight Beavers are the first Australian aircraft to be fitted with SARAH, although R.A.A.F. maritime reconnaissance Lincolns and Neptunes are being equipped with the aid. To meet the Antarctic conditions the original SARAH dry-cell battery-operated radio transmitter has been replaced by a larger and more powerful unit, as the normal type of dry cells lose 75% of their power in very cold temperatures.

R.A.F. Flying Clubs

SINCE the formation of the first Service flying clubs at Middle Wallop and Thorney Island in the latter part of 1954, the seven R.A.F. clubs now in existence have a combined membership of some 360 personnel and have logged a total of 1,500 flying hours. The two pioneering clubs had to be disbanded soon after their formation and the first of the existing clubs to be founded is No. 47 Squadron Flying Club at R.A.F. Abingdon.

The Abingdon club now has 30 members and by the end of November, 1957, had logged about 700 hours' flying. No. 83 Squadron Flying Club at R.A.F. Syerston and the R.A.F. Upwood Flying Club were formed in 1956, and together have accumulated approximately 690 flying hours. The club at Syerston has a membership of 80 and is one of the more financially successful units, being entirely self-supporting.

Formed during 1957, the four remaining clubs are at R.A.F. Watton; the R.A.F. Flying College, Manby; Boscombe Down, which includes Army and Ministry of Supply personnel from Boscombe Down and Old Sarum; and the R.A.F. Central Flying School, Little Rissington, whose members expect to start flying in the near future.

Operating Tiger Moths or Austers which are usually purchased through a loan from the Kemsley Flying Trust, the majority of the clubs now charge approximately 35s. an hour. The average subscription rate is about 35s. a year.

No. 24 (Commonwealth) Squadron

SQUADRON LEADER D. W. HITCHINS, A.F.C., of the R.A.A.F., has taken over the command of No. 24 (Commonwealth) Squadron at R.A.F. Colerne from Sqn. Ldr. M. M. Mair, who has been the temporary C.O. since Sqn. Ldr. R. B. Bolt, D.F.C., R.N.Z.A.F., returned to New Zealand in the middle of last year. Between 1953 and 1954 Sqn. Ldr. Hitchins commanded the Australian V.I.P. Flight, and was personal pilot to the Governor-General of Australia, Field Marshal Sir William Slim. Prior to his posting to the United Kingdom he was serving in the Department of Air, Melbourne.

Since it was given the designation "Commonwealth" in 1947, No. 24 Squadron has been commanded in turn by officers of the R.A.F., R.A.A.F., R.N.Z.A.F. and S.A.A.F. A Transport Command squadron equipped with Hastings, it is employed on routine and V.I.P. transport duties.

The Year of Sport

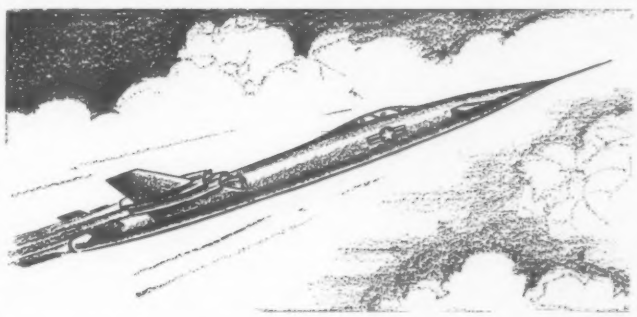
A NUMBER of outstanding successes in the field of sport were obtained by members of the R.A.F. and W.R.A.F. during the past year. In the 1957 R.A.F. Athletics Championships in July, five new R.A.F. and one new W.R.A.F. records were set up and an existing record was equalled. The R.A.F. won the Sefton Brancker Athletics Competition against Middlesex and the Civil Service in July, and Service representatives also came first in the A.A.A. decathlon Championship and in the 220 yd. at the A.A.A. Championships.

Altogether six R.A.F. records and three W.R.A.F. records were set up in the year—by the R.A.F. in the 220 yd. (21.7 sec.); 440 yd. (48.9 sec.); 880 yd. (1 min. 53 sec.); 440 yd. hurdles (55 sec.); long jump (23 ft. 2 in.), and Javelin (207 ft. 2 in.), and the W.R.A.F. in the discus (100 ft. 11 in.); 80 metres hurdles (12.6 sec.), and 440 yd. (1 min. 5 sec.).

In cross-country running the R.A.F. beat the Army and the Royal Navy in the inter-Services championships—the sixth successive win by the R.A.F. which has now won 16 out of 26 in the series. The R.A.F. and W.R.A.F. were both first in the 1957 inter-Services athletic championships and the R.A.F. was also first in inter-Services dinghy racing, golf, hockey, lawn tennis, diving, swimming and water polo, and the W.R.A.F. won the inter-Services cricket.

Boracic Bomber

WHILE the British Government has been fiddling and scribbling, and scrubbing out supersonic bombers on White Paper, the Americans have been doodling, but not dawdling; they have been, in fact, drawing and driving ahead to the blueprint stage to replace the subsonic B-52 and, presumably, the supersonic B-58, with a manned-missile-type Mach 3 bomber, designated the WS (Weapon System) 110A. It has been known for the past two years that Boeing and North American Aviation were engaged in design studies of the WS-110A and on December 23, North American were proffered this pocket-warming Christmas present from the Pentagon. One might even say that it was practically snatched away from Boeing's Christmas tree; but the ordinary taxpayer isn't likely to shed many tears on that account—and for two reasons: (1) Boeing's tree, at the moment, is laden and bending over with a $2.5 billion backlog, plus the prospect of a further $700 million almost ripe for plucking; and (2) the American taxpayer's back will be bent a bit more to foot the mounting bill anyway!



Also well known has been the fact that the WS-110A was being projected around new turbojet engines powered by the new high-energy or so-called " chemical " (or " zip ") fuels such as pentoborane, giving considerably greater heat per unit weight and heat per unit volume than such a currently used fuel as kerosene. Thus, if kerosene be taken as unity, the energy performance index of pentoborane is some 87% greater, being 1.6 times better than kerosene on weight and 1.17 on volume (1.6 x 1.17=1.87). Because of the erosion effect of these boron-based fuels on the turbine blades and other parts, they cannot readily be burnt upstream of the turbine and, for the present at any rate, they are likely to be restricted for use on the afterburner (downstream) side of the jet. From which one might infer that the long-range cruise performance is still subsonic at, say, 0.90-95 Mach, with a supersonic over-the-target dash of Mach 3 plus. At this stage we are congenitally inclined to question the Credulity Coefficient of the newsvendors with their tall story of 2,200 m.p.h. (3.3 M.) flown over intercontinental ranges, without refuelling, at 100,000 ft. (The official U.S.A.F. announcement mentions a speed in excess of 2,000 m.p.h. and an altitude over 70,000 ft.)

From the accompanying artist's sketch—courtesy of the *Los Angeles Times*—the WS-110A is presumed to follow the general configuration of North American's Navaho XSM-64 rocket-boosted ram-jet missile which, it will be recalled, was recently shot down by the U.S.A.F. after an outlay of nearly $700 million. If this presumption turns out to be a reasonably near guess, then perhaps some of this sizable sum, although mere bread-crumbs to Pentagon " brass," may be looked upon as the Biblical bread cast as seed upon the waters of the Nile—to return after many days in the manned bomber form of the WS-110A. (We will not stretch the simile further by hinting that the boracic bomber will be raining down manna from Heaven!) The " many days " in this case, however, will certainly be longer than the annual crop return from the bread basket of the Nile Valley. Official estimates for the first flight suggest around two-and-a-half years, but North American, in characteristic North American fashion, are figuring on cutting their cloth and sewing it up in two years.

According to the aforesaid newspaper account, the size of the WS-110A will be somewhere between that of the B-52 and the much smaller and lighter B-58. The powerplant is believed to be six afterburning turbojets, the artist's imagination running to four engines embedded but not fully submerged in the wing structure, with the remaining pair in the after-body for some reason not immediately apparent. Possibly, though, this is pure conjecture or, maybe, the perversity that makes one man's doodling the other chap's eyesore! Other imaginary features are the twin tail-end stabilizers and the canard-type slab elevators or pectoral fins which follow, of course, the layout of the Navaho. While these forward control vanes seem eminently logical, we can see no reason why they should be located slap in front of the pilot's line of take-off and landing vision. If we were doodling this job from scratch, we would reverse (or at least readjust) the respective positions of cockpit and elevators.

Furthermore, since most of the elongated body is obviously designed around the bomb and fuel tank requirements—which means that the wing can be thin and dry—it seems absurdly old-fashioned to mount only four of the engines in the wing, like beer-barrels. Clearly, here is scope for a bit more ingenuity by flattening out the ends of the jet pipes and exhausting the gas stream through simple split-type trailing-edge flaps—a combination jet flap and variable afterburner nozzle, in fact—as we suggested over four years ago in these pages. (See " Flap-Type Jet Exit Nozzles in Submerged Wing-Engine Installations," THE AEROPLANE, September 11, 1953, p. 393.) Unfortunately, at the time this scheme was originally submitted to a well-known British firm in December, 1950, jet engine designers were difficult to wean away from their circular jet pipes projecting " proudly " (and parasitically) from the wing profile. Today, of course, they are now hanging them right outside in the breeze—a mess of poddage that puts paid to the jet flap altogether. This is likely to prove doubly unfortunate in the case of the manned Machshund missile under review because it must be potently patent that no ordinary landing chute is going to pull it up before running out of real estate. Only Muroc (Edwards A.F.B.) has 5-15-mile runways.

A team of 80 U.S.A.F. experts from the Research and Development Command, the Strategic Air Command and the Air Material Command recently conducted exhaustive, week-long evaluations of both the North American and Boeing designs, and their final recommendation for N.A.A. was unanimous. Thus ended days of rumour and suspense, for the award had been expected by mid-December. Actually, both companies had submitted design studies last year, but the U.S.A.F. asked for redesign, seeking much higher performance. (The " thermal thicket," by the way, seems to have been secretly surmounted—or silently brushed aside). The present contract gives N.A.A. authority to proceed immediately with development of the WS-110A through mock-up and prototype stage, but a quantity production contract will probably await the progress of flight performance and handling tests. It is reported that initial flight testing will be conducted with General Electric turbojets running on conventional fuel, before changing over to what are picturesquely described as " exotic " fuels.

Already acclaimed as one of America's hardest-hitting H-bomb carriers, this WS-110A contract proves the contention—say American newsmen—that ballistic missiles will not supersede the manned bomber for some time to come, especially when viewed in conjunction with another N.A.A. development contract—the long-range interceptor fighter of equal or better performance. Presumably, the manned nuclear bomber will follow the chemical bomber; and so with the long-range missile and anti-missile we complete the full circle by returning to the long-range gun—with the gunners cosily ensconced in a hole in the ground. Looking backward to the two-billion-dollar blunder of the piston-engined B-36, which was all tooled up for the jet age that consigned it to the scrapyard, it may yet turn out that the British White Paper was foresighted in scrubbing out the last two generations of manned supersonic bombers. And we have a feeling that the conferenciers are going to out-manœuvre the bombardiers—when the shouting and the tumult dies.—S.H.E.

Shaft Turbine for Helicopters

SINCE the gas turbine aero-engine was introduced the frontiers of its domain have steadily widened, and an ever-growing number of uses have been found for this type of powerplant. There is now rapidly increasing interest in the 1,000-s.h.p. shaft-turbine engine as a powerplant for helicopters, and British airframe builders are no less interested than their American counterparts. One of the best and most interesting engines in this class is the General Electric T58, which passed its official U.S. Government type-approval test last November.

The T58 was developed by the Small Aircraft Engine Dept. of the General Electric Co. at Lynn, Massachusetts, in connection with the U.S. Navy Bureau of Aeronautics, to meet helicopter requirements for a gas-turbine engine in the 800- to 1,500-s.h.p. group.

Implicit in the requirements were a low specific fuel consumption; high power/weight ratio; durability and reliability;

ANNULAR TUBE.—The G.E. T58 has a single annular flame-tube with 16 fuel-injector nozzles at the front end. Ignition is by discharge from a single capacitor-type igniter.

and stable, selective constant-speed control for the rotor to free the pilot from constantly monitoring powerplant operation when flying over "difficult" country.

With these considerations in mind, performance guarantees were chosen to give sufficient margin for horse-power, specific fuel consumption and engine weight for a design which would give rapid response to power demands and be simple to maintain in service. The guarantees for the first production model were for 1,024 s.h.p. at take-off with an s.f.c. of 0.66 lb./s.h.p./hr. and 875 s.h.p. normal power rating with an s.f.c. of 0.69; the weight including reduction gear to be 335 lb.

As a result of testing the first batch of 22 engines built for helicopter development work the average maximum performance was found to be 1,060 s.h.p. and the s.f.c. 0.65. Some engines developed more than 1,100 s.h.p. for an s.f.c. of 0.63. The average engine weight was 324 lb. From this it can be seen that the 3.27 s.h.p./lb. power/weight ratio of the T58 in its present early stage of development is by far the highest yet achieved for a shaft-turbine engine.

Engineering Details of the T58

In common with other designs in the 800- to 1,500-s.h.p. group of shaft-turbine powerplants, a free power-turbine is used to drive the engine-output shaft, there being only a gas link between the gas-generator section and the power-turbine wheel.

The basic gas-generator section consists of a 10-stage axial compressor, annular combustion chamber and two-stage turbine. This unit could, if required, be used as a turbojet unit—an exhaust cone assembly replacing the power turbine. In fact, this version of the engine was run on test so that the gas-generator section could be operated up to full power without using either a rotor or a dynamometer to absorb the output.

Forming the air-intake duct to the compressor, the front frame of the engine also provides support for the engine controls and accessories section, which includes fuel and oil pumps driven by a power take-off from the gas-generator rotor.

The compressor is interesting in that not only are the inlet guide-vanes provided with controlled variable incidence, but also the first three rows of stators. This variable stator feature appears on other G.E. engines, notably the J79 turbojet used in the Convair Hustler, Grumman Tiger and Lockheed Starfighter. It is a means of obtaining flexibility of handling characteristics with a high pressure-ratio single-spool compressor.

The combustion system is of annular type, the outer casing being split on the horizontal plane for inspection access. There are 16 fuel-injector nozzles mounted on the front end of the combustion-chamber flame tube. Ignition is by discharge from a single capacitor-type igniter.

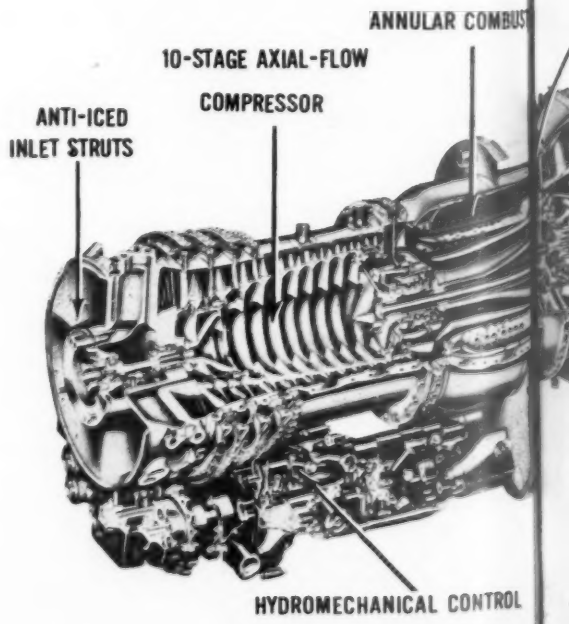
The two-stage turbine of the gas-generator is mounted directly on the rotor shaft, with cooling provided by air bled from the compressor. Aft of the gas-generator turbine wheels is the free power-turbine which drives the engine-output shaft. This single-stage turbine wheel operates at moderate temperatures and has an overhaul life greater than that of the gas-generator section. Therefore it should not be necessary to remove this component between normal overhauls.

Output speed of 19,500 r.p.m. is converted by the reduction gear to that required for helicopter use. This gearing provides for power take-off either fore or aft, according to rotor layout and engine location of the particular helicopter. Similarly, the exhaust pipe may be arranged to vent in any of three directions—to either side or downward.

Constant-speed rotors are required for many modern helicopters and the T58 has been designed with this feature in mind. This allows the helicopter rotor to operate at best efficiency, the constant-speed control being set by a cockpit lever to any desired rotor r.p.m. This control automatically adjusts the gas-generator speed to maintain the free-turbine speed required to drive the rotor at the r.p.m. set by the pilot.

Testing and Development

Since testing started on April 5, 1955, more than 6,000 hr. of running have been completed with the T58. This comprises 5,000 hr. of factory development testing, 700 hr. of helicopter



Photograph copyright "The Aeroplane"

PARISIAN POWERPLANT.—Although the star exhibit on the General Electric stand at the 1957 Paris Salon was the CJ-805 (civil J79) turbojet, the little T58 shaft turbine was also displayed and impressed with its neat appearance. Note the location of variable-incidence inlet guide-vanes and first three stages of compressor stators.

rotor operation and 300 hr. of other testing, including anti-icing, hot and cold running, use of alternative fuels and production testing.

Flight-test programmes are in progress with a Sikorsky HSS-1 (S-58) and with a Vertol H-21D, each of which has a twin-engined installation in place of the single piston engine formerly used. The T58 engine has been specified for the new Sikorsky S-62 and the Kaman HU2K-1.

The engines now being flight-tested were built to the same standard which passed a 50-hr. test in August, 1956. A measure of the performance is that the first batch of experimental flight-test engines was returned to General Electric after 135 hr. of running.

Before going ahead with the 150-hr. acceptance test, certain improvements were made to the compressor rotor blades, combustion system and power control.

After 2,500 hr. of engine running, using 12 compressor assemblies, a problem arose with some of the rear-stage compressor rotor blades, which began to show fatigue in the dovetails and there was one instance of blade failure, although the engine ran for 8 hr. afterwards and the blade was contained by the casing. The origin of this fatigue was found by strain-gauging the rotor blades. This showed that it was caused by excitation in the first torsional mode at compressor speeds relating to the normal rated power condition.

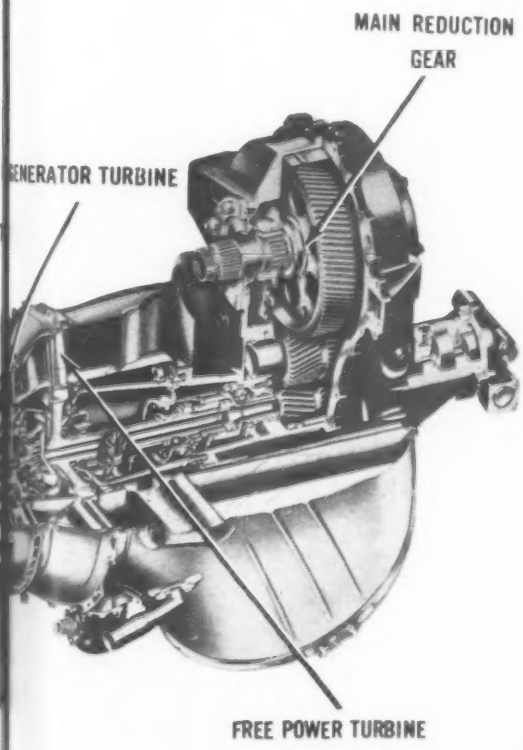
Manufacturing improvements were found to have altered the original mass and vibration characteristics of the blades. To remedy this the rotor-blade dovetails were strengthened and the vibration characteristics altered.

Considerable improvements were made in flame-tube life between the 50-hr. and 150-hr. tests. The original flame-tube had inadequate temperature distribution and hot-spots occurred on the combustion-chamber casing. The improved flame-tube has several major modifications: positive distribution of primary and secondary air flow was obtained at the exit from the compressor; the cowl was redesigned; the positioning of the flame-tube in relation to the diffuser and combustion-chamber casing is more precise; the position, area and number of louvres and holes have been changed; and overall length and provision for thermal expansion have been modified. The new flame-tube shows no signs of deterioration after 180 hr. of operation and one has completed 330 hr. of running to the full test-schedule programme.

Problems with the T58 fuel controls were reduced to a minimum by the use of computer studies and investigations with a rotor test-rig. The first batch of engines had an insufficient margin of stability which did not allow enough consistent automatic engine starting. An improved fuel-control unit has been developed and is being retrospectively fitted to all engines in use. This unit has done 15,000 hr. of bench testing of all kinds.

A new specification of JP-4 fuel contaminated with dirt, rust and lint has been used for some tests and is representative of the worst conditions found in the fuel tanks of aircraft carriers and other vessels from which a T58-powered naval helicopter would operate.

Between the first engine run and the type-test, 17 engines were used in development work. The total T58 testing time at the date of the type test was 5,200 hr. The test engine was



GENERAL ELECTRIC T58

TWO FOR ONE.—Replacing the single piston-engine of a Sikorsky HSS-1, the twin-T58 installation provides over 2,000 s.h.p. for 650 lb. weight compared with 1,600 s.h.p. for the 1,400 lb. reciprocating engine. A further pair of G.E. T58 shaft-turbine engines is being flight-tested in a Vertol H-21D helicopter.

operated on JP-4 fuel and ran for a total of 181 hr., at the end of which it was still running perfectly.

Compared with the specification requirement of 1,024 s.h.p. maximum power and a specific fuel consumption of 0.66 lb./s.h.p./hr., both with 5% allowable deterioration of performance, the type-test engine gave 1,065 s.h.p. reducing by only 1.4% to 1,050 s.h.p. and had an s.f.c. of 0.655 lb./s.h.p./hr. which increased 2.1% to 0.669.

In parallel with test-bed running, a helicopter rotor test-rig has been used. This has a Sikorsky S-53 rotor system and a coupling-gearbox allowing the use of two engines. Since April, 1956, this rig has accumulated 250 hr. in checking transient engine characteristics, the phenomena of rotor response and the power "splitting" between the two engines.

Flight Test Results

Flight test data with the Sikorsky and Vertol helicopters agree well with the results obtained by rig-testing and the rapid change of power output to maintain constant-speed operation of the helicopter rotor is particularly good.

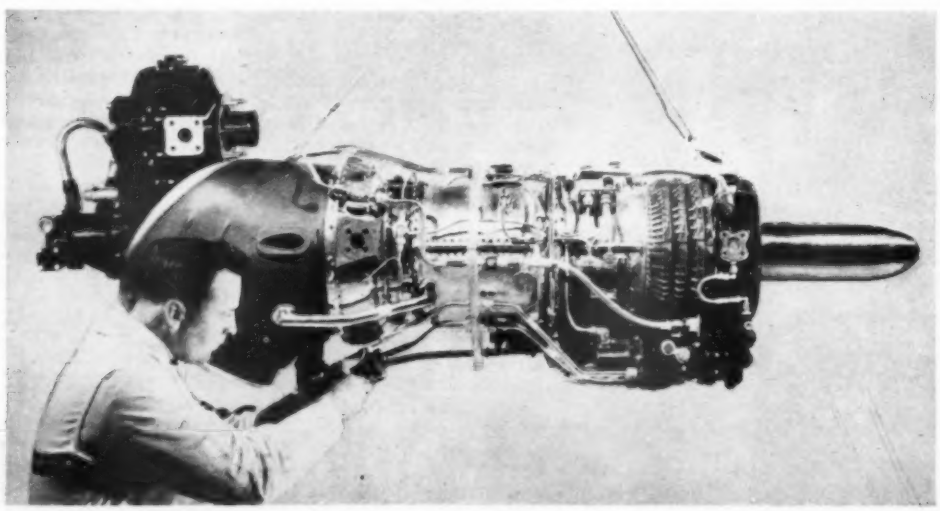
Engine failure has been simulated during twin-engined flight by putting one engine control lever to the "idle" position in half a second. This resulted in the "dead" engine torque dropping from 670 ft.lb. to zero in less than 2 sec. The "live" engine responded so that within 3 sec. it had automatically met the full rotor-requirement and was operating at a new stabilized power-setting about equal to the original total power of both engines.

The T58 engine has been flight-tested at heights up to 5,000 ft. and at airspeeds of more than 160 m.p.h. in autorotation, *chandelles*,* single- and twin-engined landings, and rates of climb of 2,000 ft./min.

Further detailed investigations are to be made in a Sikorsky S-58. This will permit the investigation in greater detail of compressor-inlet pressure-distribution relative to airspeed with varying rotor-blade dynamics; engine restarting in flight; engine control system behaviour and temperature characteristics.

Although the prime application for the T58 and its contemporaries is as a helicopter powerplant, there is no reason why a turboprop version should not find favour for fixed-wing aircraft as a replacement for existing piston engines of lower power and greater weight.—D.G.

* The term *chandelle* is used to indicate what was originally known as an Immelman Turn. It is not a stalled turn and is best described as a mixture of a loop and a steep turn. The aircraft is not stalled and it completes the manœuvre at a height greater than that at which it was started.



COMPACT POWER.—Features of the General Electric T58 shaft-turbine engine are a 10-stage axial compressor, annular combustion chamber, two-stage gas-generator turbine and single-stage free power-turbine driving the reduction gear. In common with the G.E. J79 turbojet, the T58 has both variable-incidence inlet guide-vanes and compressor stators.

Details of the P.1's Mainplane

One of the three lectures given at this year's Southampton Conference of the Institution of Production Engineers was a detailed survey by MR. F. BRADFORD, A.F.R.Ae.S., *and* MR. G. H. TAYLOR, *of the English Electric company, covering the design, development and manufacture of the P.1 wing structure. On this and the following pages are some of the matters they discussed.*

IN the introduction to their written paper, the authors explain that the P.1's airframe has the usual breakdown into the main components of fuselage, wings, tailplanes and fin. The order of assembly is, they remark, unusual in the case of the wings to the fuselage as each wing is built independently and joined together at the aircraft centre-line, forming a continuous spanwise unit.

Each wing has a main structural unit or torsion box, part of which is sealed off to contain fuel in a pressure-tight compartment. To this unit are attached the leading and trailing edges, tip structure and ailerons.

Because of the shallowness of the wing-box, the production shop personnel could not be expected to assemble the unit in the usual manner, where the structure is built up in skeleton form and the outer skins subsequently attached. Further, since squeeze-riveting was considered essential for fuel tightness, the limited access did not permit the entry of a riveting machine capable of applying sufficient force to close the rivets.

This restricted access, the need to maintain a very high standard of sealed riveting, the effective sealing of permanently attached structure, and the exclusion of all drilling on the final assembly stage decided—apart from the aerodynamic and stressing cases—the following requirements on which the design was to be based:—

(1) The assembly of all structural members to the skin panels in an open condition to permit sealing of the structure and obtain the best possible access for riveting.

(2) Separate components of the structure to be kept to a minimum.

(3) Minimum final assembly work inside the confined space of the tank.

(4) Consequent upon (3), and to prevent contamination of sealant by swarf, the elimination of all drilling at the final stage of assembly.

(5) Avoidance (where possible) of skin and structure joints in the tank area.

(6) Simplification of connections inside the structure by elimination where practical of multiple bolted or riveted joints.

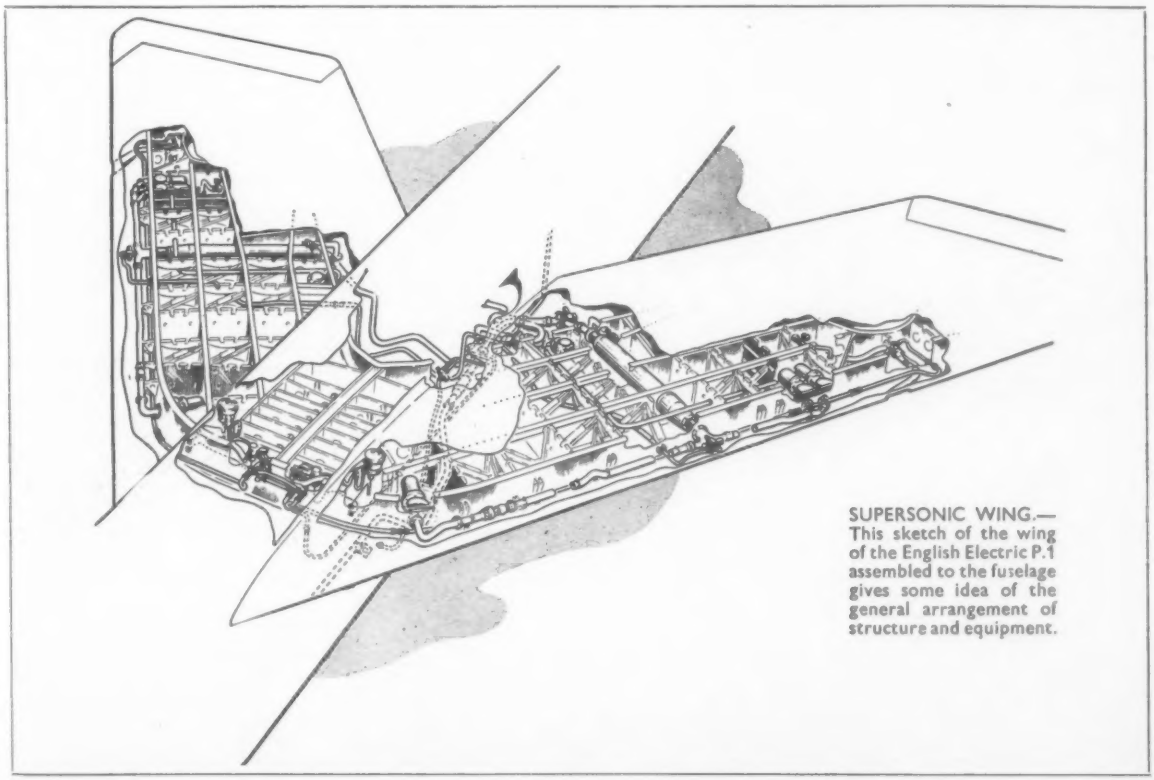
The skin panel is cut from a large sheet of DTD.687, 0.2 in. thick. The inboard end of the skin panel is reinforced by the addition of thick laminations, and the outer end reduced in thickness by controlled-depth routing. By careful arrangement of the reinforcing and locality of machining, it has been possible to maintain a uniform stress distribution.

Internal structure consists of five spars. Between each pair of spar booms are two extruded stringers, each being riveted to the skin panel. Crossing these are rib members similarly attached.

The main essentials for these internal spars and ribs are booms, diagonal bracings, and vertical members or posts between the booms. The vertical posts provide a combined attachment for both rib and spar diagonals, and only the latter are required to be inserted on the final assembly.

This type of construction was chosen primarily because of the extremely limited access during the build-up and also due to the arrangement of jig control and method of assembly. Diagonal bracings with one bolt at each end were far simpler to locate and attach than shear webs with a multiplicity of fixings.

Apart from the usual test work associated with any structural development, there were some aspects requiring investigations



SUPERSONIC WING.—This sketch of the wing of the English Electric P.1 assembled to the fuselage gives some idea of the general arrangement of structure and equipment.

relating to maintaining a pressure-tight fuel tank, since it was considered essential to attain 100% sealing even under extreme conditions. Earlier experiments had proved the failure of sealants, subsequently applied to completed structures, to seal effectively; and that where possible more than one line of defence against leaks should be provided.

Previous experience had shown that the static pressure testing of a tank was of little value and the only way to prove the efficiency of the sealing was to apply a racking load to the tanks, whilst under pressure. Accordingly, model tanks were built, representative in all details of the actual aircraft tanks.

One of the most serious effects of stress applied to a tank is distortion at the corners. The three faces forming the corners are invariably slightly changing their angular relation to one another and this, coupled with the variety of sections meeting to form the corner, probably make these the most critical of all joints to seal.

A synthetic rubber block moulded to a comparative shape is fitted to the corner and retained on two outer faces by a wall extending slightly above the level of the block. A bolt passes through the rubber block and metal pad into a retained nut capable of free vertical movement. Tension on the bolt applies pressure to the metal pad and consequently on to the rubber, which is thus forced into the desired intimate contact with the surfaces of the corner. The actual hole in the extreme corner is not itself sealed, instead the leak paths to it are isolated by blanking off the approaches.

As in all structures, certain members must butt up against others, and it is a production advantage if the gaps between them can be generous. These can, however, be a hazard for effective pressure tightness, and many devices were tried before the following satisfactory solution was evolved.

The corner joint described above includes certain of the seals developed to prevent leaks through these gaps. The design

A close-up of part of the wing skin assembly showing the arrangement of spar booms, stringers and sub-ribs.

again relies on a rubber block being forced into intimate contact with the surfaces surrounding and across the leak-path.

Through both adjacent members where the gap exists, and through a top packing plate, a hole is drilled to suit the rubber plug, stopping at the inside skin level. Again, the same technique of applying pressure to the rubber by means of a bolt and pad is used, as in the corner joint. An additional item that is required, is the top packing plate to provide a complete circumferential seal above the level of the gap. No attempt is made to fill the cavity between the abutting parts, but simply to seal all the faces which are in contact with the rubber.

Coupled with the design of the corner sealing were the development of a satisfactory rubber material to withstand total immersion in kerosene and drying out over a wide range of temperatures, and also the manner in which the various shapes

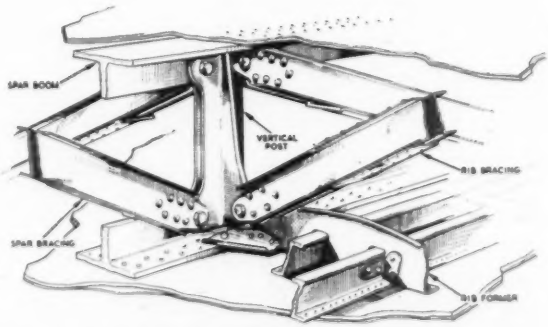
Squeeze riveting is used for the skin panel structure and is done in this special machine which provides 6 ft. of vertical movement and 18 in. of horizontal movement for the riveting head.

of sealing blocks were to be manufactured. The material ultimately chosen to withstand a temperature range of −50° C. to +100° C. was Hycatrol H.E.4. This showed a minimum loss due to immersion in kerosene and remained flexible at the lowest temperature.

Two types of panels form the closure of the tank unit and since they form the webs of the spars, they are required to carry shear loads. To ensure maximum shear efficiency of the joints between the webs and boom flanges, no gasket-type sealing is employed. Instead, for panels requiring infrequent removal, the sealing is by a nylon monofilament 0.005 in. thick laid in two parallel lines close to, and on either side of, the bolting lines and retained in position by a thin adhesive coating.

Panels providing access for servicing of equipment buried inside, and for inspection of the tank, have an integral seal permanently fitted, which does not require refitting on subsequent replacement of the access panel.

Due to the limited access to the interior both during and after building the tank, it was essential that a really satisfactory sealing of the bolts and rivets, particularly through the skin, was obtained. In the bolt design ultimately chosen a small ridge is produced on a standard countersunk head form; this bites into



A typical spar/rib connection in the main wing box of the P.1.

the material in which the head seats, and becomes self-sealing. As an additional safeguard, however, sealant is applied to the bolt shank before insertion.

The rivet sealing is very similar but in reverse. As the rivet material is softer than the skin, the ridge would flatten during riveting, so instead this is formed in the countersinking of the hole.

Fatigue testing of both rivets and bolts showed no adverse effect. It was thought the notching effect of the bolts in the skin material, and similarly in the rivet head would have proved serious, but this was not the case.

To ensure that the fuel compartment retains its pressure tightness under all circumstances and conditions in service, the sealing wherever possible is at least duplicated. The surfaces of any adjoining parts are coated with an interlaying sealant and a fillet of slightly heavier sealant applied along each edge.

All rivets, though self-sealing, are dipped before closing in the same material used for the structure sealing, and a fillet of sealant applied to the panned head. The ridged-head bolts are similarly coated with sealant before insertion and, in addition, special ring washers which seal both the shank and the inside face of the structure are fitted under the nuts. The bolts through the outer spar web and access panels have sealing washers both under the heads and under the nuts.

Manufacturing Processes

Mr. Taylor opened his section of the lecture by saying that the design and production organization behind the P.1 building programme had been a matter of close co-operation between the design office and the factory. The main problems arising from the design proposals were concerned with utilizing the facilities already available for the rapid production of the prototype.

Farnham Rolls were available for rolling the skins to curvature. A skin-routing machine had to be constructed to rout the profile and rebate the skins. The length of skin ultimately exceeded the length of the available rolls, which illustrates how existing facilities frequently fall short for the next requirement. It was possible, however, suitably to modify the machine by extending the length of the rollers, except for the last 4 in., when the frame of the machine interfered.

A special routing machine was schemed and built to cater for machining the profile, rebates and recesses in the skin panels. This provided the bare essentials, a table and longitudinal slides on which ran a cross beam carrying the router head. A vacuum table was added later. The large recessed areas, outboard, in the top skin were routed—a tracer for contact with the template being also used as a skid on the top surface of the skin, to control more accurately the depth of cut.

The top face of each spar boom was twisted in order to follow and mate with the skin curvature. As first designed they were to be made from three T-section extrusions, the top flange of each being extruded 90°, 87½° and 85½°. This was a convenient compromise to the twist required on each spar boom—i.e., spar No. 3, 90°; spars Nos. 2 and 4, 87½°; and spars Nos. 1 and 5, 85½°.

The point of bend selected did not go a long way to facilitate the twisting operation, which was carried out with the units in an annealed condition, on a Mills hydraulic press. The actual spar assembly jig was used as a reference gauge, during the development stage, the spars then being solution treated, adjusted and finally aged.

Subsequently an Onsrud spar-milling machine was available, with a twist milling feature on the No. 1 spindle. The extrusions were redesigned and this feature utilized, which considerably eased and practically eliminated at least one of the complications of the bending and twisting requirement, with particular emphasis on spars 1 and 5. These were bent to a 56-in. radius—in a direction, relative to the T-section, which was the least helpful—to the shape of a hockey stick.

Bending the 56-in. radius of the "hockey stick" shape was further complicated by another rise in a vertical direction, in order to fit the camber of the inside of the skin as it followed around from the leading edge to approximately the wing centre-line. This was carried out on a Hufford A.46.

Spar and Torsion Box Assembly

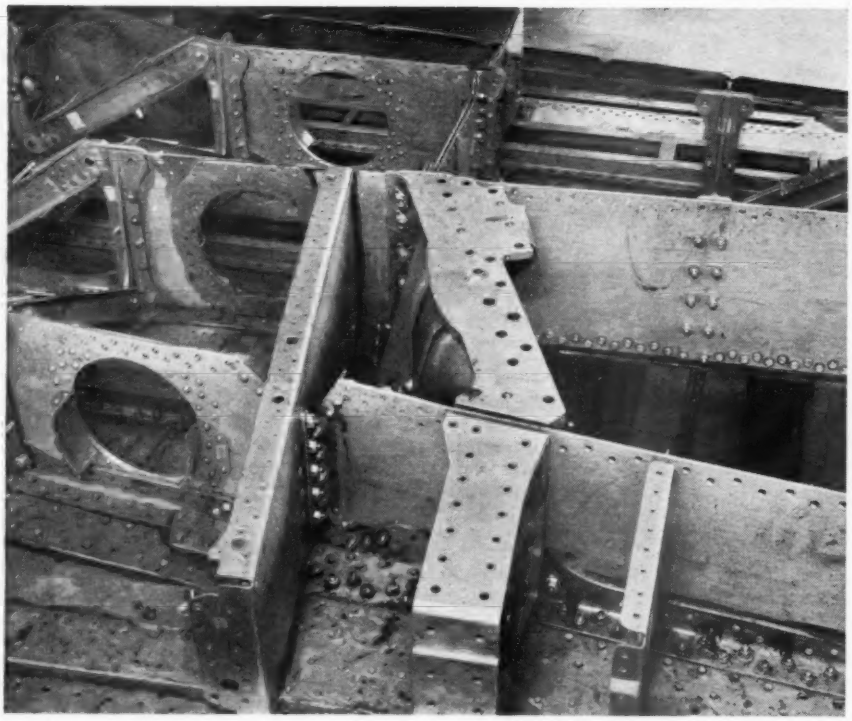
The spar booms are located in their individual assembly jigs together with their various attachments, the inside skin line being carefully taken care of, and all holes in the way of the diagonals and bracing members drilled and reamed and, with fitted bolts, bolted together. The bolts are not locked, as the whole assembly has to be dismantled later.

The spars are located in a vertical assembly jig and the ribs, undercarriage brackets, and other structure assembled, all holes being reamed. Assembly at this stage is only with fitted bolts and without sealant. Each skin is then offered up in turn for drilling and reaming of all rivet and bolt holes.

Next, the wing structure is completely dismantled. The wing components are kept as a set; and any finishing, such as countersinking and deburring, is carried out. The skins and elements of structure to be riveted to the skin are then thoroughly cleaned, the mating surfaces coated with sealant and the components riveted up in a special riveting machine.

It was decided that any attempt at positioning either the skin in suspension, or a strong enough squeeze riveter in suspension over a rivet head, would be quite inefficient. The machine provided has vertically balanced moving platforms

Wing structure being assembled to the bottom skin components. Note the type of diagonal bracing that is used in place of shear webs.



Another close-up of the wing structure during assembly of members to the bottom skin unit.

with 6 ft. of vertical travel and 18 in. of horizontal travel for the dolly and the hold-up tool, and follows the curvature of the skin.

An operator on the head side inserts the rivet and places the hold-up tool, and the operator on the panned side "draws up" and squeezes. This can be carried out on any rivet over an area 72 in. by 18 in.—after which the skin may be moved into the next required position. The platforms are balanced and may be easily moved up or down by hand.

The bottom skin component, with all its attachments sealed and riveted, is placed in a horizontal assembly jig which locates all essential points and maintains the wing skin contour. Spar and rib vertical members are then attached and the top skin with its attachments lowered into position. The internal attachments are then made, working progressively outwards from the centre.

It is during this stage that the amount of work necessary inside the structure has to be kept to a minimum, since the gap for access is narrow, and through this the operators have to reach locations for the final attachment bolts. To provide the maximum space possible, the booms of the front and rear spars are left off until all the internal work is completed. The final attachment of these spar booms is carried out by means of a special portable squeeze riveter.

At this stage the tank unit is complete and is pressure tested. The important feature of this part of assembly is that no drilling or reaming is carried out, with no danger of swarf collecting in the tank or being picked up by the sealant.

Attachment of the leading- and trailing-edge structure to the main wing box is carried out in a separate jig. These units are conventional ones.

The joint for marrying the port and starboard wings together at the aircraft centre-line is carried out by the provision of suitable packings of Dural strip on the abutting edges of the top and bottom skins at the centre-lines. These are machined to follow the aerofoil curvature, but in a horizontal plane while the wing is lying in its natural flying position at the 2° anhedral angle. This provides a parallel landing at the inboard end of each wing to accommodate the insertion of the wing centre rib and "straight-across" doubling plates on the outer surfaces which make the joint.

At present the method of machining the packings requires a special purpose machine tool of the company's own design and construction. The completely assembled wing box is located in its true position, and the path of the cutter to machine the packings is controlled from a cam by a hydraulic copying attachment. This machines the packings on the top and bottom surfaces of each skin, and also machines the skin edges to provide the correct gap.

The marrying jig takes care of the port and starboard wings located by their own wing-to-fuselage pick-ups, in which position the wing centre rib is inserted and the drilling and reaming for the bolts through the butt straps, skin edges, packings and rib is carried out. The wing-to-fuselage skin angles are also drilled at this stage with a drill jig gate to obtain interchangeability.

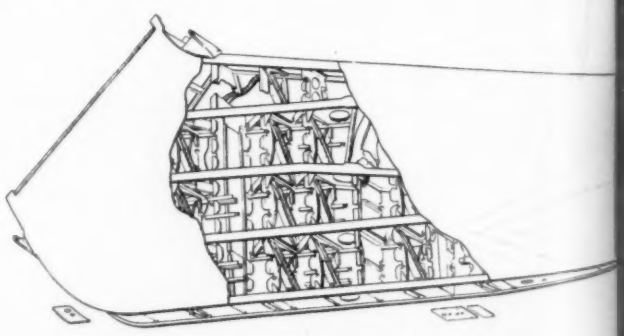
Machined items in the P.1 wing were not unduly complex, the wing centre rib being the largest of the units. Owing to the necessity for weight consideration, die stampings could do little to avoid machining all over—draft angles having to be removed and the small fillet radii required usually being too small to forge satisfactorily. The main gain was in obtaining some external profiles to shape and the elimination of the "hogging" surplus metal plus, of course, obtaining the correct grain flow.

The wing centre rib is made from a solid billet and all the pocketing and internal surfaces machined by routing—the external profile surfaces being machined on a Hydrotel. Generally a much larger amount of double curvature machining was introduced by reason of flanges, etc., fitting directly to the skin surfaces, and consequently because of weight saving considerations, allied surfaces had to follow similar paths.

This rib was not taken up as a die stamping owing to the cost of the dies, uncertainty of quantity and the fast rate of metal removal by the router.

Special-purpose machine tools were designed and built for machining the packings on the wing joint, and for profiling the spar booms after bending to the hockey-stick shape.

The main undercarriage bracket as a die forging was well worth while, compared with machining it from solid. Machining was fairly straightforward, and it might be of interest to mention that boring the S.99 steel bearing cap *in situ* with the light-alloy bracket, using a carbide tool, presented no difficulty—approximately 0.0005 in. ovality being evident at the cut interruption on the joint face.



A sketch of the P.1 main wing box showing the disposition of the members.

A New Lightplane Industry

THE NEW YEAR at Croydon Airport was marked by the first flight of the first Druine Turbulent single-seat light aeroplane to be built in Britain. It has been produced by Rollason Aircraft and Engines, Ltd., and in most respects is identical to the French original.

Roger Druine's designs, notably the Turbulent and its two-seat variant, the Turbi, have been built in quantity in France, many by amateur constructors, and several others are on the way to completion in the United Kingdom.

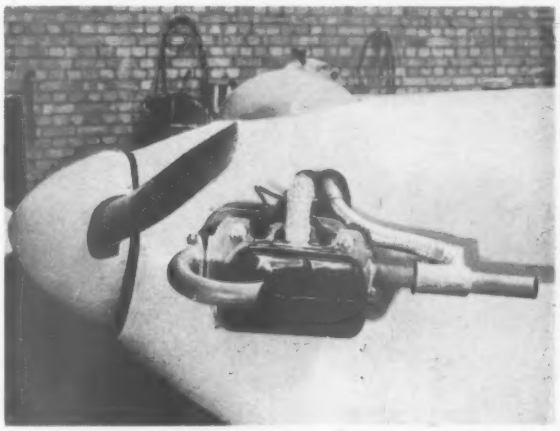
Rollason's aircraft, G-APBZ, was taken up on January 1 by Mr. Norman Jones, well known as the chairman of the company and of the Tiger Club, and he made a number of circuits at a cruising speed which he said later was around 80 m.p.h., making this aircraft somewhat faster than the French version. G-APBZ appeared to behave well in the air, despite the gusty weather, and the pilot said afterwards that he was almost able to fly it hands off—in calmer air he would certainly have done so. The unstick distance was rather longer than expected, but that was most likely because, in the early testing stages, the pilot did not get the tail too high in case of nosing over.

G-APBZ departs from the French design in having wheels of slightly smaller diameter (12 in.); the landing gear is built to a different standard; the tail-wheel has been replaced by a skid; no brakes are fitted, and an Ardem flat-four engine is installed.

The Ardem 4CO2 was designed by Roger Druine from a type of car engine used extensively on the Continent, and the particular model fitted to G-APBZ has been modified by Rollasons. It develops 30.7 b.h.p. at 3,000 r.p.m. and weighs 133 lb. Its fuel consumption is 17 pint/hr. An earlier conversion made by Rollasons, designated the RTW, had a direct-drive magneto shaft on the rear face. Its installation would have involved cutting a space in the engine bulkhead and for this reason was not approved by Druine for the British-built Turbulent, although it has possible uses for other aircraft. The 4CO2 has a chain-driven magneto underneath. A two-blade wooden Merville propeller is fitted, and the fuel capacity is 8.8 gal.

Construction follows orthodox form. The main framework of wings and fuselage is of spruce, and the fuselage and leading-edges of wing and tail unit are ply-covered with madapollam over all. The first aircraft was entirely hand made. A second has been laid down and four more are planned. Rollasons expect to be able to sell the complete aircraft for about £1,000, and Ardem engines are available for other builders of Turbulents for £272 10s. each, less propeller.

The company is perhaps most widely known among the maintenance and overhaul organizations at Croydon, having been associated with that aerodrome almost as soon as it was opened, shortly after the First World War. The firm specializes in Tiger Moth work, and is closely allied with the Tiger Club. As we recorded recently, it also acts as agents for the Thruxton Jackaroo. Forty people are employed, including administrative and clerical staff. Nevertheless, the first Turbulent has been less than a year abuilding, and subject to its passing its tests and orders being received there are hopes that a positive series production can begin.



The installation of the 30.7-b.h.p. Ardem 4CO2 flat-four engine in the Turbulent.

There is room in this country for an ultra-light single-seater for the pilot who wants to fly purely for the fun of it, even though at present his activities are restricted more than we consider necessary, and it may well be that Turbulents and their like will eventually replace, or at least supplement, the other, larger, designs which are now commonplace.

An account of flying the Turbulent was published in THE AEROPLANE of April 27, 1956. Detailed figures for the Rollason Turbulent are, naturally, not yet available. Data for the standard version are as under:—

DIMENSIONS.—Span, 21 ft. 5 in.; length, 17 ft. 4½ in.; wing area, 80.7 sq. ft.

WEIGHTS.—Empty, 341 lb.; loaded, 607 lb.

PERFORMANCE.—Maximum speed at sea-level, 87 m.p.h.; cruising speed, 74.5 m.p.h.; landing speed, 28 m.p.h.; initial rate of climb, 492 ft./min.; endurance, 2.5 hr.; take-off run, 145 yd.—H.J.C.

Photographs copyright "The Aeroplane"

THOSE RESPONSIBLE.—Left to right, R. F. Thompson, chief inspector; W. V. FitzMaurice, secretary; F. Hounslow, in charge of Ardem conversions; Alan Sproxton, director; D. James, chief woodworker; L. M. McPherson, general manager, and A. Deverell, senior inspector.

Air-lifting Le Bourget's New Beacon

Above, this Decca Type 41 Storm Warning Radar was recently installed at Le Bourget. Right, conventional installation methods proved difficult, so a helicopter lift—by a Bell 13H of Fenwick Aircraft—was used.

Above, the Bell lowers some of the equipment into position—the whole lifting operation was completed in less than 2 hr., the main loads being the scanner "dish" and its associated gearbox.

Right, preparing to lift the scanner from the tarmac. This equipment will have a storm-warning range of up to 250 miles and will be used by the French Meteorological Service; it was installed by Decca's agents, O.M.E.R.A.

The Last Schneider Trophy Winner

AIR CHIEF MARSHAL SIR JOHN BOOTHMAN, K.C.B., K.B.E., D.F.C., A.F.C., F.R.Ae.S., who died in London on December 29 at the early age of 56, was one of the best-known and best-liked of men in British Aviation. His achievement, in 1931, of winning for this country the internationally coveted Schneider Trophy gained him a popularity and respect which were maintained ever after, and his death will be sadly felt by a great number of friends, not least at the Royal Aero Club for which he did so much.

John Nelson Boothman was born on February 19, 1901, and educated at Harrow County School. His interest in aviation began at an early age, and his first flight was made, in 1911, with no less a person than the celebrated pioneer, Colonel Cody, who, wanting lightweight ballast to enable him to compete in a flying competition at Brooklands, asked a boy in the crowd to accompany him.

Boothman's enterprising nature led him to leave school in 1917 for war service, and, having been unsuccessful in entering the R.F.C., he served with the French Red Cross as a motor driver in Salonica, when he was awarded the Croix de Guerre (Bronze Star).

After the First World War he began flying privately at Hendon, and in March, 1921, his efforts to take up Service flying were rewarded when he was accepted for a short service commission in the General Duties Branch of the R.A.F. After service in Constantinople he returned to the United Kingdom to take a flying instructor's course at the C.F.S. On passing out he remained there as an instructor for three years, and then was posted to the Middle East, flying with Nos. 55 and 30 (Bomber) Squadrons in Iraq.

At the beginning of 1930 he was selected for high-speed research flying, and so joined the High Speed Flight set up specifically to take part in the 1931 Schneider Trophy Contest. Boothman was among those who flew in the contest, and in the Rolls-Royce-powered Supermarine S.6B covered the course along the Solent at 340.08 m.p.h. and was nominated the winner. As Great Britain had won the contest on the two previous occasions (in 1927 and 1929) the trophy passed permanently into the possession of this country. It now has a proud place in the Royal Aero Club, of which Sir John had been vice-chairman since 1952.

With the lapse of the contests and the temporary inactivity of the High Speed Flight, Flt. Lt. Boothman, as he then was, moved from Calshot to the A. and A.E.E. at Martlesham Heath, and continued on research work. He remained there until 1935, when he took a course at the R.A.F. Staff College. After three years on staff duties he was appointed, in September, 1939, to command No. 44 Squadron, which was flying Blenheims. At the end of that year he went to the Air Ministry for air staff duties in connection with fighter operations, followed by his appointment to Bomber Command, and in March, 1941, he was posted to command R.A.F. Waddington. This appointment lasted only until the following October, for, with his already wide experience of staff duties and operations, he was sent to Washington as adviser to the U.S.A.A.F. on the lessons which had been learnt by the R.A.F. during operations.

He returned to command R.A.F. Finningley, leaving that post in the middle of 1942 for duties in the Directorate of Operational Requirements at the Air Ministry. A year later he was commanding No. 106 Wing at Benson, and later No. 106 P.R. Group. In this latter appointment he was responsible for a great deal of the air reconnaissance necessary to bring about the success of the D-Day landings in June, 1944. After these duties had been discharged (and he continued to fly himself whenever possible) he returned to the A. and A.E.E., by then at Boscombe Down, as Commanding Officer.

Sir John N. Boothman (1901-1957) held many successful appointments in the service of his country.

In 1945 he was promoted Air Vice-Marshal and became Assistant Chief of the Air Staff (Technical Requirements), largely responsible for the R.A.F.'s equipment policy. He was appointed A.O.C., Iraq, in November, 1948, returning after two years to become Controller of Supplies (Air) at the Ministry of Supply.

After three years, during which time his possibly unique suitability for the post was exploited to the full, he became, in November, 1953, A.O.C.-in-C., Coastal Command, an appointment he held until his retirement from the service in April, 1956. Within NATO he was Air C.-in-C., Eastern Atlantic and Allied Maritime Command, and Air C.-in-C., Channel Command.

When serving in Iraq Sir John's health had suffered, and ever since he had not been entirely fit, but was determined to serve his full time. On his retirement he became technical sales director of Kelvin and Hughes, Ltd.

He was awarded the A.F.C. in 1931, made C.B. in 1944, K.B.E. in 1951 and K.C.B. the following year. He was also a Commander of the Legion of Merit (U.S.A.), and held the American D.F.C. and the War Cross of Czechoslovakia.

News from Russia

ACCORDING to reports from Moscow, scientists from the Fuel Institute of the Academy of Science have produced a new form of petrol fuel, which can easily be transported in open box-type lorries, goods rail trucks and normal cargo ships. They claim that the new product does not exhale dangerous explosive fumes, and makes the contemporary transport tanker outdated.

This fuel is produced in ordinary brick shape, and is prepared in a specially designed mixing apparatus which is combined with a high-efficiency press. The liquid fuel becomes a solid mass after a chemical reaction, which occurs during the mixing when a particular type of "plastic substance" is added.

After being formed, the "bricks," which contain 95% pure fuel, are covered with a protective film to prevent evaporation and to some extent mechanical damage. Before use this solid petrol is treated in a regenerating plant and becomes again a normal liquid fuel.

It is claimed that apart from the main regenerating plants, the Russians also have similar small mobile plants, which are suitable for adaptation on motor cars, tractors and aircraft. The "fuel bricks" are resistant to changes in temperature, rain and snow, and can be stored under water for a considerable period.

It is understood that this new product is particularly suitable for transportation on long undeveloped routes, and where tanker storage is either impossible or impracticable.

* * *

Professor Pobiedonoscev, of the Academy of Science in Moscow, has published an article in a Russian astronomical journal in which he repeats the previous claims made by his colleagues, that the carrier rocket of Sputnik I was not burned out during the passage through the Earth's denser atmosphere, but fell on or about December 1 on U.S. territory in South-Western Alaska. According to Russian calculations, the carrier rocket was on that date in the orbit along the Irkutsk-Chukots Peninsula-South Alaska-Western Rockies route, when it entered the Earth's atmosphere and started losing height very rapidly.

It is appreciated in Russian circles that because of subsequent friction and generated heat, part of the rocket's structure was consumed, but this last-stage carrier also consisted of material resisting very high temperatures, namely the rocket engine itself, which should have survived this last part of the journey. Prof. Pobiedonoscev, however, does not disclose what may have become of the rocket's remains upon impact with the Earth's surface, but he states that so far there was no response from the American State Department to the Russian request for the eventual return of Sputnik I's carrier.

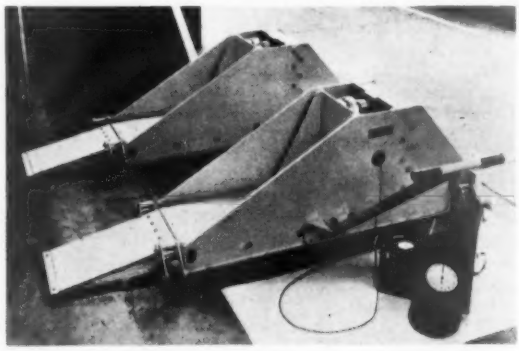
NEWS OF INDUSTRY

Thrust-measuring Platforms

DEVELOPMENT has now been completed by B.O.A.C. on portable platforms for measuring the thrust of any installed powerplant through the undercarriage of the aircraft. This equipment, designed by Mr. F. S. Saunders of the company's engineering staff at London Airport, is capable of proving with extreme accuracy the actual power developed by an engine fitted in an airframe under static conditions.

Approved by the A. and A.E.E., Boscombe Down, and accurate to within ±.3%, the two platforms illustrated can receive aircraft of the single-wheel-main-undercarriage type of up to 40,000 lb. and will measure a total thrust of 28,000 lb. Larger platforms are available for taking twin-wheeled or bogie-undercarriage aircraft of up to 200,000 lb. in weight and of any thrust up to 1,000,000 lb.

Apart from the platforms, a lateral support capable of taking the loads exerted through the undercarriage and a tractor to pull the aircraft into position are required for the test. The actual thrust meter, which has an accuracy of ±5 lb. in 14,000 lb., is separate from the main platforms and is fitted with flexible capillary tubing and detachable equipment for remote reading.



A pair of portable platforms designed by Mr. F. S. Saunders of the engineering staff of B.O.A.C. for measuring the actual thrust of an installed powerplant through the undercarriage of an aircraft. The thrust meter in front of the platforms has an accuracy of ± 5 lb. in 14,000 lb.

Missile Camera

IN 1955 de Havilland Propellers, Ltd., asked the Williamson Manufacturing Co., Ltd., to design a radically new camera for mounting in the Firestreak air-to-air missile to assist in the development programme associated with the weapon. The object of the camera was to help in the assessment of the target "miss distance" of the Firestreak as the D.H. team considered that a better result could be obtained by a camera mounted on the missile than by the previous photograph assessment techniques employing high-speed wide-angle ciné-cameras fitted on the target drone or aircraft.

Required to provide 360° annular cover, with 50° forward cover, and sharp photography, and be sufficiently robust to withstand loadings of up to 100 *g*, the unit consists of eight small cameras, each containing single-exposure film with individual shutters simultaneously triggered. On completion of a test firing the missile breaks up and the section containing the cameras and telemetry systems falls freely on to the firing range.

The inertia of the camera-operating system had to be reduced as far as possible to minimize the time delay and to obtain the requisite image-stopping speed. A number of techniques were tried and the prototype camera employed explosive motors, which, after further development, meet the specification requirements. The camera also had to withstand temperatures of 100° F. as the missile flame tube passed through it.

Recently carried in a number of Firestreaks fired in Australia, the camera system is capable of development to meet other specialized requirements and the same basic shutter design could be used in other fields.

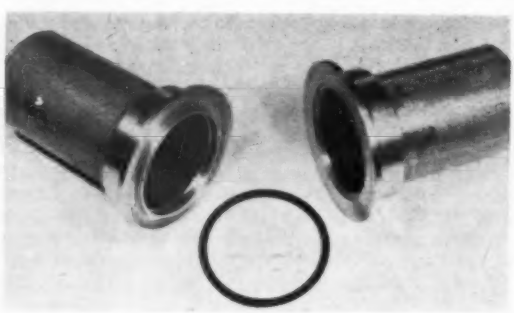
Rigid Tube Couplings

A MECHANICAL method of attaching couplings of the swivelling, bolted or "vee"-flanged types to rigid tubing is being developed by Avica Equipment, Ltd., of Hemel Hempstead. This system of jointing has the important advantage of eliminating distortion caused by the welding of the end fittings, which makes the production of complete tube assemblies to fine tolerances difficult, and reduces the need for highly skilled operators. In addition, the non-weldable grades of aluminium and stainless-steel tubing may be used.

The process consists of internally expanding the tube, by means of a roller tool, into grooves machined on the inside surface of a ferrule, thus forming a metal interlock which is resistant to conditions of internal pressure impulse, extremes of temperature and vibration, and is leakproof up to the burst pressure of the tubing being used. Relatively simple tooling is required for this operation, consisting of the split die and holding blocks for the various sizes of ferrule and also for the appropriate rolling tools.

The ferrule may take the form of an engaging flange for the coupling in its swivel-flange version, which is being developed for high-temperature applications in conjunction with a high-temperature seal, or it may form an integral part of a "vee" flange for coupling with the conventional clamping devices.

Typical of test results obtained are the following made by an aircraft manufacturer in the United States, in which a swivel-flange fitting for 2-in. O.D. tubing was subjected to a tensile test and required a load of 4,750 lb. to pull off the tube. At an internal pressure of 400 p.s.i. and subject to thermal shock conditions between —65° F. and +160° F., no leakage was apparent. On vibration-impulse tests the couplings were subjected to resonant frequencies over a range of 50 to 2,000 c.p.s. with accelerations from 10 to 25 *g*, and at internal pressure impulses of 0-120 p.s.i., at 10 c.p.s., without failure. The pressures quoted in these tests are those required to prove the coupling for systems of given pressures only, as the coupling design is such that, as mentioned earlier, tube-burst pressures will normally be achieved without leakage at the joint.



The "vee"-flanged ferrules and "O" ring of the mechanical method of attaching couplings to rigid tubing being developed by Avica Equipment, Ltd., of Hemel Hempstead. The "vee" flanges are coupled by conventional clamping devices.

New Radio Equipment

A PROTOTYPE unit of the new STR.23/24/35/36 comprehensive VHF/ILS/VOR airborne communication and navigation equipment developed by the radio division of Standard Telephones and Cables, Ltd., was recently displayed for the first time. Employing transistors and other techniques, such as printed circuits, the equipment has considerable savings in weight, size and power consumption over earlier designs.

The STR.23 VHF equipment provides communications facilities in the 118 to 135.95 Mc/s. band and the transmitter operates on 360 channels spaced at 50 kc/s. intervals. The receiver, which is also used in conjunction with the navigational aids, has 560 channels spaced at 50 kc/s. intervals in the 108 to 135.95 Mc/s. band. Both units have a frequency accuracy of .005% and a total weight of 32 lb.

Made up of the SR.34 VOR/ILS localizer receiver, the SR.35 glide-path receiver and the SR.36 75-Mc/s. marker receiver, the navigational and landing aid units of the equipment have a total weight of 44 lb. The localizer has 100 channels in the frequency band 108 to 117.7 Mc/s., spaced at 100 kc/s. intervals, and the glide-path receiver provides 20 channels spaced at 300 kc/s. apart in the 329.3 to 335 Mc/s. band.

GLIDING NOTES

FOR two years nothing has been seen of the German magazine *Thermik*. It was started 10 years ago in duplicated typescript form, the editor being Hans Deutsch, then 20 years old. Apart from his willingness and suitability for the job, it was, I understand, with one eye on the Allied authorities that the choice was made of someone too young to have been active in pre-War aviation.

The journal soon appeared in printed form, and, after it had been running four years, German gliding started up again. But in spite of publishing excellent articles, the paper was always in financial trouble, largely owing to the gliding fraternity reading other people's copies instead of buying their own. After the beginning of 1956, no copies were sent abroad, and later that year publication ceased. Hans Deutsch was lost track of for a time, and then reappeared in the Foreign Legion!

Now, suddenly, an issue dated December, 1957, has turned up, with the same style of cover but larger, so that it is now the same size as THE AEROPLANE. The price is DM1, and postage is free on a three months' order. The publisher and editor is Hans Folgmann, of Duisburg-Hamborn, Schulstrasse 30.

So the Germans have once more a journal devoted entirely to soaring flight—or have they? It starts off with an article on flapping flight, animal and human, but it is an old tradition that a soaring magazine may include such material. Then we have Dr. Raspet's calculation of the smallest possible effective sailplane of conventional shape; its span comes out at 25 ft., its weight 100 lb., minimum sink 1 ft. 9.7 in./sec., and best gliding angle 1:20. An article on the aerodynamics of the tailless "Flying Plank" gives its minimum sink as 4 ft./sec. at 50 m.p.h. and best gliding angle as 1:19.8 at 59 m.p.h. A table giving full details of circling flight for eight different machines shows that, with 30 degrees bank, the time to go round varies from 16.6 seconds for the French Emouchet to 21.6 seconds for the German two-seater Mu-13E. The new Darmstadt D-34, with many original features, is described, and there are, of course, many news items.

But then come two pages on multi-purpose private aeroplanes, followed by 3½ pages on amateur aeroplane construction, and finally three pages on model gliders (there is, by now, a German magazine devoted to model flying, called *Flugmodellbau* and likewise published in Duisburg). It is to be hoped that these items do not foreshadow the sort of change that took place around 1934 when *Der Segelflieger* changed its title to *Luftsport und Jugend*. Under present conditions many more German glider pilots than formerly could afford to buy their own copies of *Thermik*, and the standard of its gliding articles should ensure it a foreign circulation. There is surely no need to include mechanically assisted aerial transport.

* * *

FROM January 14 to February 8 a Slingsby Skylark will be on show at the *Daily Herald* International Holiday and Travel Exhibition at Belle Vue, Manchester, and somebody will be there to hand out information about gliding. Unfortunately the newspaper's Press Relations Office put out a statement that the Skylark "has a tail weight of 465 lb." Somebody must have been silly enough to write the word "tare" in longhand instead of typing it.

The Dutch magazine *Avia-Vliegwereld* has been favoured with a description of a new Slingsby product, the Swallow, or T-45, which has a span of 12 metres (39 ft. 4½ in.), with a laminar-flow wing, and is intended to give the best performance compatible with a low price suitable for gliding clubs and private owners. Apart from the sentence "De cockpit is comfortabel," British glider pilots interested in what sailplane manufacturers are doing in their own country will probably need the help of a Dutch dictionary. However, readers of the British gliding magazine will, if their reading extends to the advertisement pages, find themselves permitted to know that "Deliveries commence April, 1958," and will also see three-view drawings and estimated performance curves. The latter show a best gliding angle of about 1 : 24 at 44 knots and a minimum sink of about 2.8 ft./sec. at 38 knots, while at 60 knots the sink is only 5 ft./sec. and gliding angle 1 : 20.

The name was to have been "Sparrow," but it was changed to "Swallow" when, during a test flight at Sutton Bank, it tried to perch on some telegraph wires by the main road. [The three-view drawing is reproduced below. —ED.]

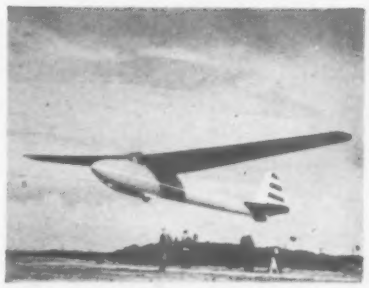
* * *

ALTHOUGH performance depends on span, other things being equal, there are times when a small-span machine can outclimb a larger one by being able to turn in smaller circles, as for instance when the thermals are narrow or have strong cores. It must have been on such a day in 1931 that the first investigations into "dry" thermals were made by aero-towed pilots around Berlin, for they reached the conclusion that only a very light, very small sailplane could twist and turn quickly enough to catch the lift. The result was the famous Windspiel, of 12 metres span like the Swallow, but built with great labour and expense because of minute care in weight-saving by every possible means—in fact, the whole wing was in one piece. It once held the World's distance record.

* * *

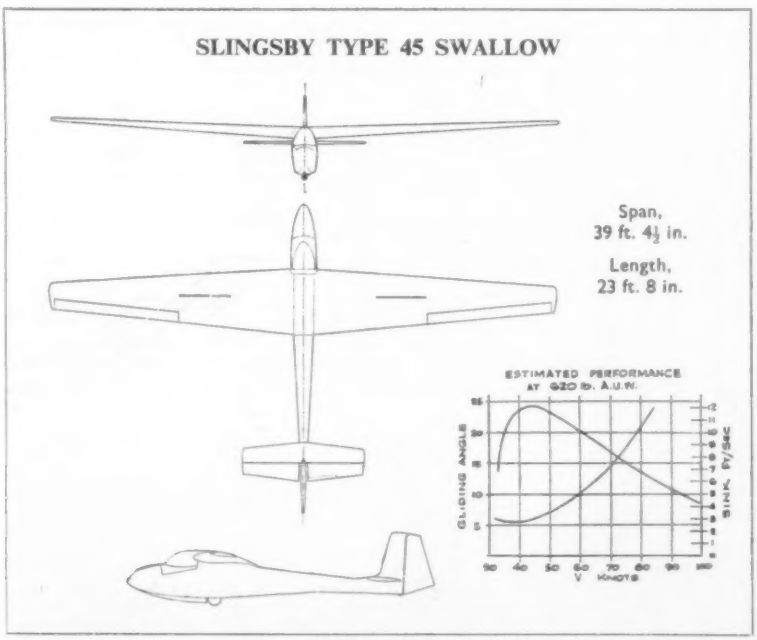
AT the World Championships in Poland next June, Keith Wakeman will, it is announced, represent New Zealand. He recently made that famous wave flight of 270 miles from South Island to North Island. Australian representation seems still doubtful, for the voting for and against was equal at the annual meeting of the Gliding Federation of Australia, and went in favour only when the chairman gave his casting vote. Those against participation used the argument that the money would be better spent on gliding at home. This argument was to be heard in Germany five years ago, though without avail. It may be demonstrably true, but if everybody believed it, there would be an end of all international contests.—

A. E. SLATER.



AIRBORNE AT CAMPHILL.—The Olympia "Speedwell 2" of the Derbyshire and Lancashire Gliding Club, here flown by Mr. Graham Elson who recently gained "Gold" height in the wave indicated by the clouds in the background.

SLINGSBY TYPE 45 SWALLOW



The Latest in Carriers

DUE to be commissioned at Portsmouth next Tuesday, January 14, H.M.S. "Victorious" (Captain C. P. Coke, D.S.O., R.N.) will begin her preliminary sea trials early in February following a seven-year refit and modernization, which to all intents and purposes has been a reconstruction of the 16-year-old aircraft carrier. The "Victorious" will be the sixth modern carrier to join the Fleet since 1945 and is the first to be fitted with the fully angled flight deck of 8¾° in addition to the latest mirror landing aids, steam catapults and latest arrester gear.

Started in October, 1950, the modernization programme of the carrier has been prolonged over the years to allow the latest devices and equipment to be incorporated and, in addition to the aids already mentioned, the most outstanding units are the air-defence radar installations and the semi-automatic electronic system for collecting and displaying the overall battle information. During the reconstruction work and refit nearly 15,000 tons of plating, machinery and internal fittings were removed, and approximately 18,000 tons of similar equipment was added. Originally 22,600 tons, the displacement of the "Victorious" on the completion of its modernization is approximately 30,000 tons.

The underwater beam has been increased by 8 ft. and, as a result of the fitting of the angled deck, which extends outward on the port side for 41 ft., the overall beam of the carrier is now 150 ft. To allow for the addition of an extra gallery deck immediately below the flight deck, the latter, which has a total length of 775 ft., has been raised 4 ft. The island is small by present-day standards and therefore gives the maximum possible deck area for aircraft handling.

To be recommissioned on January 14, H.M.S. "Victorious" will be commanded by Captain C. P. Coke, D.S.O., R.N., who previously served in the carrier during the 1939-45 War.

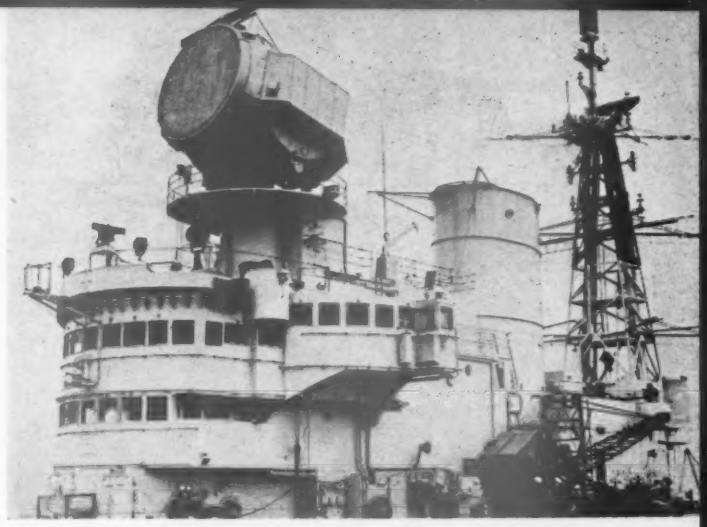
Fitted in the normal forward position on the flight deck are two parallel 145-ft. standard B.S.4 steam catapults with aircraft positioners and two jet-blast deflectors. These catapults are capable of launching all future Naval aircraft up to, and including, the Blackburn NA.39.

Apart from its small size, which had been made possible by the siting of the two-tier operations and radar-display room below the flight deck, the island has a unique outline. This consists of a large radar scanner—the first of its size to be mounted on a warship—a conventional lattice mast at its aft end, and a single funnel in the centre. The flying control position on the island has been extended further over the flight deck and the Lieut. Cdr. Flying is now able to observe aircraft movements over the whole area in addition to watching pilots on their final approach.

Of the other aids, the two deck-landing mirror sights are fitted in the normal port and starboard positions, but because of the 8¾° angle, the port sight is mounted well outboard on

One of the two aircrew-briefing and ready rooms in the carrier. In addition, aircrew personnel have a refreshment bar and a mess for their own use between sorties, or while waiting to fly.

Photographs copyright "The Aeroplane"



One of the striking features of the "Victorious" is the very large radar scanner mounted on the island, which is considerably smaller than the normal structure for a carrier of this size. Aft is the single funnel and conventional lattice mast.

its own large sponson. The arrester gear is of the standard Mk. 13 design with four 80-ft. span wires. Two hydropneumatic operated high-speed lifts are installed on the centre line for handling aircraft between the flight deck and the hangar.

The main hangar is divided into two sections by a fire curtain of asbestos cloth and a large area on the port side has been taken up by a fireproof compartment for the assembly and functional testing of D.H. Firestreak air-to-air missiles. The lift opening to the main hangar can be sealed off by hydraulically operated hangar doors and a hangar extension is equipped as an electronics servicing bay.

Combining early warning and high discrimination of an aircraft's position in plan and height simultaneously, the radar installation in the "Victorious" is considered to be the best shipborne air-defence radar in the World today. The radar information is displayed by means of a semi-automatic electronic computer system instead of by the standard "plot" method employed in other R.N. carriers, and the actual fighter interceptor control problem is solved by computers. A semi-automatic "tote" board is used to show aircraft position and numbers.

An extensive series of land-based trials were made with this equipment before its installation on the carrier, and no major operating or technical problems are expected.

Apart from the equipment presenting the air picture to the Captain or Admiral in the operations room, there are two radar displays showing the surface situation so that a complete summary of the tactical air/sea battle is available to the ship or force commander.

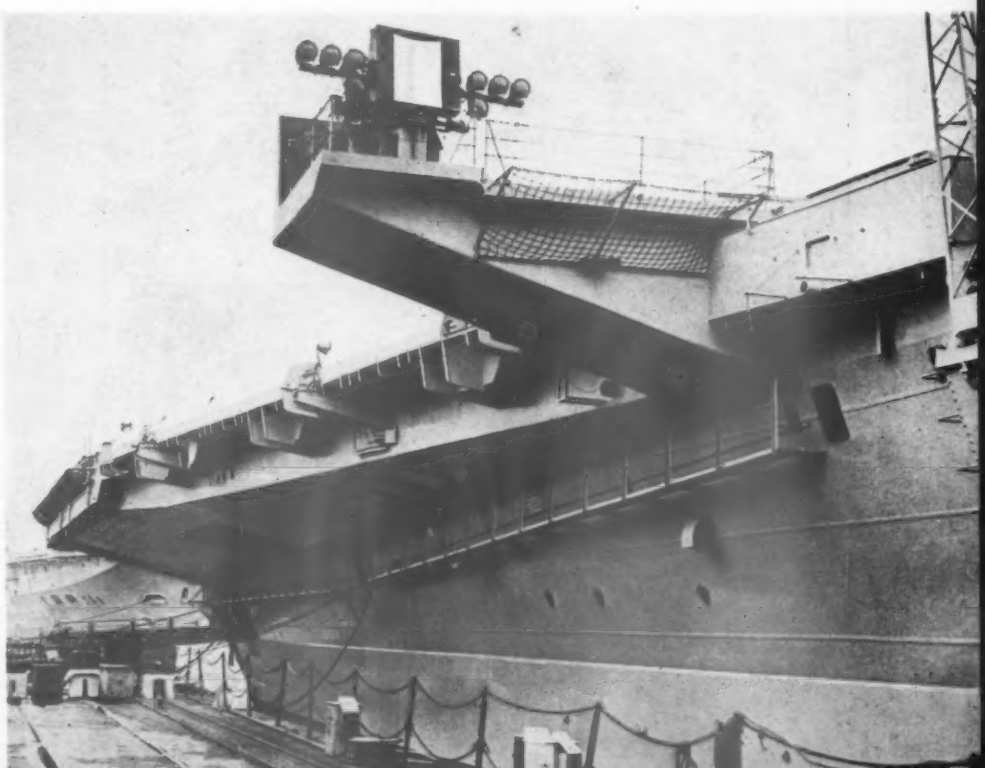
Other design features which have not been incorporated in any previous R.N. carrier include the air-conditioned upper gallery deck. Running continuously for the length and full width of the ship, it is, in effect, a development of the deep-beam system of the flight deck, the beams being deep enough to provide the necessary headroom for accommodation and office spaces.

On this deck there is a wardroom, a number of officers' cabins, senior and junior ratings' messes, all of which have bunk sleeping, and dining halls. In addition, there are two aircrew briefing and ready rooms, an aircrew refreshment bar and, for the first time, an aircrew mess in addition to the wardroom. Apart from the air conditioning, the upper gallery deck is fully lagged because of the exposed flight deck above.

The atomic, biological and chemical defence systems (A.B.C.D.) on the "Victorious" have been arranged on a much larger scale than for previous ships of any type, and considerably more compartments are protected against atomic fall-out. This has been made possible by the adoption of a group ventilation system in which a smaller number of larger fans are used. In a contaminated area, fans to the control centre can be stopped and ventilation ducts closed by gas flaps or covers. Air-filtration units allow a small quantity of fresh air to be supplied to the control centre during the closed-down periods.

For the preliminary sea trials next month a number of non-flying Sea Venoms and two operational helicopters are to be taken aboard. These will be used for aircraft-handling training and deck trials in preparation for the first operational squadrons which are planned to go aboard during the early part of the summer.

The first formations to operate from the carrier will be one D.H. Sea Venom all-weather fighter squadron, which will later be replaced by D.H. Sea Vixens, a squadron of Supermarine Scimitars, a number of Douglas AD-4W Skyraiders and an anti-submarine helicopter squadron of Westland Whirlwind H.A.S.7s. The Whirlwinds are replacing the squadron of anti-submarine Fairey Gannet A.S.1s normally making up a carrier's complement.



Looking for'ard on the port side showing the 41-ft. overhang of the fully angled flight deck and the large sponson carrying the port deck-landing mirror sight. The overall beam width of the carrier at this position is nearly 150 ft.

PRIVATE FLYING

H.J.C.'s Club Commentary:

Southend School's Activities

Malayan Training

An American Homebuilt

● MR. GERRY QUINN, C.F.I. of the **Southend-on-Sea Municipal Air Centre and Flying School**, reports that records are still being broken, both by day and night. In October and November 675 hr. were flown, including 110 hr. night flying. Since cross-country flights for the M.T.C.A. commercial night rating began on August 19, 63 night landings at Stansted have been made. This means that more than 30 C.P.L. candidates have qualified for exemption from the night-flying cross-country tests.

The new Link Trainer Section was opened on December 11 by Mr. Stephen McAdden, M.P. A D4 and an AMT 18 trainer are now fully operational. They are available for all training to the civil instrument rating standard during the week, and at week-ends by appointment. The technical training courses for the C.P.L. are to begin shortly at the Municipal College.

At present there are 52 pupils under training at Southend for their P.P.L.s, and 41 for their C.P.L.s. Three radio operators of Eagle Aviation—Messrs. Wade, Phillips and Batley—are training for their private licences, after which they will go on for their commercials. It is of interest that 14 Southend-trained pilots are now flying with independent companies at the airport.

One of the school's fleet, the Autocrat, G-AJEO, has just completed 700 hr. flying in six months, bringing the total airframe hours to 6,800. Mr. Bernard Collins, the manager of the school, writes that he would be interested to know if there is another Auster in this country which has flown so much. Perhaps some private owners will let us know.

During this year new accommodation, consisting of new members' and administration building and a new hangar, is to be opened.

INSTRUCTION AT CROYDON.—Miss "Mickey" Gilbert, instructor at the Surrey Flying Club, with one of her pupils, Mr. Robert Foster, of Tonbridge, Kent. He is Miss Gilbert's 300th pupil and has flown solo in preparation for his P.P.L. Miss Gilbert works at the M.T.C.A. and also instructs for the Kent Gliding Club.

George Meyer's "Little Toot"

THIS little biplane, produced by Mr. George Meyer, of Corpus Christi, Texas, took almost six years to design and build. He was able to fly it "hands off" on its first flight. It is fully aerobatic, with very good stall characteristics, recovering immediately pressure is released from the stick.

The fuselage is a metal monocoque from aft of the cockpit, and a tubular truss structure forward. The wings are built up on a spruce spar with wooden ribs and are fabric covered; the fully cantilever tail surfaces are of metal. A Cessna cantilever landing gear is fitted.

"Little Toot" is at present fitted with a 90-h.p. Continental engine, but it is planned later to fit a 135-h.p. Lycoming. Any engine of up to 150 h.p. may be installed.

Meyer intends to have drawings of the aircraft available at $50 a set for home construction.

DIMENSIONS.—Span, 19 ft.; length, 16 ft. 6 in.; wing area, 123 sq. ft.; sweepback (upper wing), 8°; dihedral (lower wing), 3°.

PERFORMANCE. — Maximum speed, 127 m.p.h.; cruising speed, 110 m.p.h.; rate of climb, 1,000 ft./min.

Howard Levy photographs

● FOLLOWING the offer by the Indian Government to loan a Hindustan HT-2 trainer, along with a flying instructor and a flight engineer, to the Singapore Government under the Colombo Plan, the former Government is now willing to accept pupils from Singapore at the pilot-training centre at Bangalore.

Two of the conditions are said to be that any trainee who fails to put in satisfactory work at any stage of the course will be sent back, and that the Singapore pupils will be nominated by their own Government.

So far six Singapore youths, awarded 40-hr. flying scholarships, have been trained to P.P.L. standard under the scheme. It is understood that before the Singapore Government sends pupils it is awaiting confirmation that any trained as commercial pilots will be sure of employment.

● ACCORDING TO the latest newsletter from the **Lancashire Aero Club** there is very little flying activity to report. Flying time in November consisted of 16 hr. 5 min. dual, 11 hr. 35 min. solo, and 26 hr. 20 min. club flying, making a total of 54 hr. The total time for the last six months was 1,178 hr. During November A.T.C. Cadet R. H. Jones gained his P.P.L.

(*"Gliding Notes" will be found on page* 57.)

CORRESPONDENCE

Anti-Sputnik Missiles

A POINT which seems to have escaped "Kentigern" from his article on launching Sputniks (THE AEROPLANE, December 13) is that aerodynamic lift could be used to fly heavy and therefore potentially effective satellite stages off a runway to perhaps 20 miles high using less thrust and fuel than a vertical launch would require.

The main objections appear to be higher drag, which might be only marginal compared to a much more rapidly accelerating and bigger "tail-sitter," and a lower stage-velocity, which might be rectified by switching on the boosters outside the atmosphere.

On the credit side is the use of smaller, and therefore available, rocket motors requiring less tankage and fuel pumping. Vertical launching also requires gimbal mounting of the motors which must be prone to pressure losses. When replaced by conventional aerodynamic control surfaces, the first-stage track might be corrected sufficiently to be able to dispense with second-stage steering which would account for the streamlined shape of the rocket nacelle. Finally, the expended first stage could glide home on its wings.

An argument of this nature may never directly concern this country for reasons of finance, but it is reasonably certain that the end-product in the form of missiles guided from manned satellites will!

If so, does anyone think that a space platform in a thousand-mile orbit, and a slightly variable one at that, could ever be hit by a vertically launched counter missile? If not, how about a winged counter missile on the lines that the Russians are probably using for their stolen march?

London, S.W.3. G. B. BATHURST.

Remembering the Wrights

I WAS glad to read in the current issue (THE AEROPLANE, December 27) that a museum is to be created at Kitty Hawk, N. Carolina, to commemorate Wilbur and Orville Wright.

Your readers in many parts of the World would be interested to know that there was re-created for December 17, 1953, for the Golden Jubilee of those first historic flights, the shed or "hangar" in which the Wrights housed their biplane in 1903 up to the date of the flights of December 17 of that year; also the shed in which they lived and worked.

I had suggested this to the Kill Devil Hills Memorial Society when visiting the site in the summer of 1953; and was most thrilled to note when re-visiting Kitty Hawk in June last that the sheds had been ready for the 50th anniversary; and that in the living quarters everything had been reproduced.

Today the wardens on duty tell me some 500,000 visitors, or should we say pilgrims, come to Kitty Hawk each year; the number is growing steadily. Each five years there is to be a large scale commemoration—the first will be in December, 1958. When the museum is built and filled the pilgrimage will grow even bigger. One would like to see a Royal Aero Club-sponsored and conducted visit for December, 1958. Maybe this will be possible—perhaps led by Lord Brabazon—now that people may have a dollar allowance.

New York, U.S.A. WILLIAM COURTENAY.

Engines for the Princess

TO soften the blow at Saunders-Roe could not work on the Princess flying-boats be restarted. It would mean not so many being thrown out of work at once.

Fitted with Rolls-Royce Tynes or even Conways they could do the Far East with one stop. They could be loaned to Aquila for trooping and freighting on, for example, a five- or seven-year contract.

Morden, Surrey. D. HACKWITH.

[This letter was received after last week's issue of THE AEROPLANE had gone to press but before its publication. Mr. Hackwith has not explored the question of finance. Modification would be extremely expensive and no doubt the Treasury would have to be satisfied that adequate financial arrangement could be made.—ED.]

Engine Identification

HOW many of the instances referred to by Mr. E. Hoctor in his letter of December 20 were directly attributable to the manner in which engines were identified. One, Two, Three and Four are sufficiently dissimilar phonetically to suggest that the root of the problem is not how engines are identified but the overall and detail design of flight-decks.

Providing the pilots are given unambiguous indication of which engine needs attention, providing the controls are set out in a logical sequence and providing the emergency drills are fully understood, then 1, 2, 3 and 4 should suffice.

Coloured knobs are all right if you can distinguish the colours. At night with some forms of lighting the colours themselves could give a false reading.

London, N.W.2. L. F. E. COOMBS.

Groundabout

Noise Annoys. The probability that the cabin quietness of turbo-liners may bring its own difficulties is suggested by a B.O.A.C. Britannia stewardess, whose interest in and knowledge of aviation is evident from the fact that she actually *buys* THE AEROPLANE each week. She finds that sounds such as babies' cries which are blurred by piston engines, become audible in the Britannia and thinks that the jet liners, which are even quieter, may need to have a soporific sound built in. She approves of the Britannia's air conditioning, which is much kinder to her coiffure than other aircraft have been. B.O.A.C. take good care of your hair conditioning.

*

Endurance Vile. The current *R.Ae.C. Gazette* tells a story worth passing on. A U.S. Navy long-endurance Neptune's captain called Okinawa airfield for landing conditions. "Impossible," he was told, "wind 90 knots, tornado blowing, visibility nil. What's your present endurance?"

"About 26 hours."

"That's O.K. then—call us about this time tomorrow."

*

Better than Dropping Bricks. A news agency reports that the Russians have launched "125 rocks" as a contribution to the International Geophysical Year. Taking the Geophysical part a bit too realistically.

*

Protocollective Action. The Court of the Masters and Charter of the Wardens of the Chapter and Verse of the Company of the Guild of Air Drivers and Merchant Air Navigators (or G.A.D.M.A.N.) has issued a proclamation denying, in a dignified way, that the delays in delivery of airliners is in any way due to G.A.D.M.A.N.'s insistence on the installation of bi-focal windscreens.

*

by Gwen

NOTES AND EVENTS

FOR THE AVON 200.—Centri-spun castings of stainless and heat-resisting stainless steels, made by Firth-Vickers Stainless Steels, Ltd., for the Rolls-Royce Avon 200 series turbojet now being fitted in many British aircraft. The components, 16 of them, range in size from a small housing to a nozzle box and outer casing and combine the reliability of forgings with the economy of castings.

PERMALI MOVE. — The London office of Permali, Ltd., has moved to 39 Victoria Street, London, S.W.1. It also becomes the London office for the associated companies of Hordern Richmond, Ltd., and of Hydulignum-Jabroc (Tools), Ltd. The telephone number, Abbey 6494, remains unchanged.

"OILING THE WHEELS"

FOR those who collect the lighter works and memories of the lighter moments, this compendium of the illustrations, by Peter Kneebone, which formed a recent series of Shell-Mex and B.P. advertisements, is well worth having. Twelve industries are dealt with, each by means of an informative and factual note on the activity concerned, along with a coloured pictorial *exposé* of what really happens. For good measure the all-important industrial subject of automation is thrown in to make—significantly enough—the 13th contribution.

The title of the book comes from that well-known basic and vital occupation—oiling the wheels of industry—a task with which Shell-Mex and B.P. is most closely connected. This is not a collection of contemporary art that can be bought at any bookstall. Indeed, it cannot be bought at all. But those who need a little relaxation can obtain "Oiling the Wheels" by writing to Shell-Mex and B.P., Ltd., Public Relations Dept., Shell-Mex House, Strand, London, W.C.2.

KENT EXPANSION.—Kent Continental Société Anonyme, the Belgian subsidiary of George Kent, Ltd., of Luton, announces that as a result of the expansion of its activities it moved into larger premises on November 1. The new building, which is at 27 rue Paul-Emile Janson, Brussels, houses the sales offices, service department and stores for spare parts. The telephone number is still Brussels 38.31.84.

INFORMATION BULLETIN.—The Aluminium Development Association has issued a new bulletin on soldering aluminium in its series of information releases on joining aluminium and its alloys. The principal section of the bulletin deals with soldering methods and equipment, and brief notes cover the little-used process of soldering aluminium to other metals.

FRENCH QUEST.—The French Army has appointed a mission, headed by Col. Sainte-Pereuse, to find the grave of the famous French scout pilot of the 1914-18 war, Capt. Georges Guynemer. After destroying his 54th enemy aircraft he was shot down over Ypres on November 11, 1917. His aircraft was seen to fall behind the German line, but neither his body nor any of the wreckage was found by French searchers. Fresh evidence has prompted the French Government to seek for the grave. The mission is at present awaiting the Belgian Government's permission to begin the search.

NEW ACCOMMODATION.—The London office of the Pulsometer Group has been moved to Pulsometer House, 20-26 Lamb's Conduit Street, London, W.C.1. Telephone number, Holborn 1402.

BRITISH STANDARD.—A revised edition of the British Standard first published in 1943 on the "Spot welding of light assemblies in mild steel" has been issued by the B.S.I. Known as BS.1140:1957, the new publication specifies revised requirements for the parent metal and for the welding pressures.

Aviation Calendar

January 14.—R.Ae.S. Boscombe Down Branch lecture, "Aircraft Control," by Professor G. A. Whitfield, B.Sc., F. Inst.P., A.F.R.Ae.S., A.M.I.E.E., in the lecture hall, A. and A. E.E., **Boscombe Down,** Hants, at 17.45 hrs.

January 15.—Inst. Prod. Engineers Southampton Section lecture (in conjunction with R.Ae.S.), "International Geophysical Year," by Dr. R. de Atkinson, at **Christchurch Town Hall,** at 19.15 hrs.

January 15.—R.Ae.S. Leicester Branch, Main Society lecture, "Rolls-Royce Engines," by A. A. Lombard, F.R.Ae.S. (chief engineer, Rolls-Royce, Ltd.), in the lecture theatre, **Loughborough College,** at 18.45 hrs.

January 15.—R.Ae.S. Brough Branch lecture, "Aviation's Profits," by J. Laurence Pritchard, in the lecture hall, Electricity Offices, Ferensway, **Hull,** at 19.30 hrs.

January 15.—Kronfeld Club debate, "This House Wants Gliding in Comfort and Joy," at 74 Eccleston Square, **London,** S.W.1, at 20.00 hrs.

January 18.—Aircraft Recognition Society, 11th All-England Aircraft Recognition Competition, in the lecture theatre, R.Inst. of Great Britain, 21 Albemarle Street, **London,** W.1, at 14.15 hrs.

January 21.—Inst. of Civil Engineers lecture, "The Design and Construction of the Foundations and Pressure Shell of the 8 ft. by 8 ft. High-speed Wind Tunnel of the R.A.E., Bedford," by J. F. Greinig, R. W. Horsman and A. N. Kinkead, at Great George Street, **London,** S.W.1, at 17.30 hrs.

January 21.—R.Ae.S. Luton Branch lecture, "New Methods of Approach to Airworthiness," by W. Tye, O.B.E., B.Sc., F.R.Ae.S., in the Napier senior staff canteen, **Luton Airport,** at 18.15 hrs.

January 21.—R.Ae.C. Dinner to Winner, King's Cup Air Race, and British Air Racing Champion, at 119 Piccadilly, **London,** W.1, at 19.30 hrs. for 20.00 hrs.

January 22.—Kronfeld Club film show, "Test Flight," and "Approaching Speed of Sound" (Shell-B.P. Films), at 74 Eccleston Square, **London,** S.W.1, at 20.00 hrs.

January 28.—R.Ae.S. Bristol Branch lecture, "Aircraft Flight Systems," by Capt. A. M. A. Majendie, in the conference room, Bristol Aircraft, Ltd., Filton House, Bristol, at 18.00 hrs.

CHANGE OF ADDRESS.—The Elgar Machine Tool Co., Ltd., has moved from Feltham, Middx., to new premises at 172-178 Victoria Road, Acton, London, W.3.

Company Notices

NEW COMPANY

Cramic Aircraft Components, Ltd. (595,658).—Private co. Reg. Dec. 19. Cap. £100 in £1 shs. Objects: To acquire the whole or any part of the assets and undertaking of Cramic Engineering Co., Ltd., manufacturers of and dealers in all types of component, parts, machinery, lubricants, enamels, varnishes, woods and things of all kinds for incorporation in aircraft, flying machines, aeronautical apparatus and missiles, etc. Subscribers (each with one sh.): G. Crout and E. Moss, secretaries, both of 59-67 Gresham St., London, E.C.2. The first directors are to be appointed by the subscribers. Solrs.: Linklaters and Paines, 59-67 Gresham St., London, E.C.2.

New Patents

APPLICATIONS ACCEPTED

790,463.—Communications Patents, Ltd.—"Simulation of aircraft icing and de-icing effects." Aug. 3, 1956.

790,572.—Soc. Nationale de Constructions Aéronautiques du Nord.—"Device for measuring the speed of an aircraft particularly in the trans-sonic range." Oct. 24, 1955 (Feb. 19, 1955).

790,540.—"Fairey Aviation Co., Ltd.—"Missiles." —April 23, 1953 (Jan. 24, 1952).

790,560.—Saunders-Roe, Ltd. — "Helicopters." Aug. 31, 1956 (June 2, 1955).

790,632.—Bristol Aircraft, Ltd.—"Aircraft flight controls." Dec. 15, 1955 (Dec. 24, 1954).

Applications open to public inspection Feb. 12, 1958; opposition period expires on May 12, 1958.

790,876—Sud-Est-Aviation, Soc. Nationale de Constructions Aéronautiques, formerly Soc Nationale de Constructions Aéronauriques du Sud-Est.—"Helicopter rotor blades, method of and means for manufacturing same."—Jan. 19, 1956 (Jan. 20, 1955).

Applications open to public inspection on Feb. 19, 1958; opposition period expires on May 19, 1958.

Personal Notices

BIRTHS

Bacon.—On December 23, at Nicosia, to Jean (*née* Calder), wife of Flt. Lt. G. Bacon—a son.

Barnes.—On December 28, at York, to Anne, wife of Sqn. Ldr. H. J. C. Barnes—a daughter.

McKay.—On December 20, at Galashiels Hospital, to Margaret (*née* Blackwood), wife of Flt. Lt. I. McKay—a daughter.

Southward.—On December 24, at Manchester, to Winifred (*née* Underwood), wife of Sqn. Ldr. Southward—a son.

Taylor.—On December 22, at Bicester, to Patricia (*née* Rodwell), widow of the late Flt. Lt. R. V. Taylor—a daughter.

MARRIAGE

West—Furmston.—On December 23 at Hitchin, Flt. Lt. Hubert J. West, D.S.O., D.F.C., to Margaret H. Furmston.

DEATHS

Burns.—On December 24, at Newtonmore, Air Cdre Eric S. Burns, C.B.E.

Warburton. — On December 26, at White Waltham, Flt. Lt. J. Warburton.